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EPA Superfund
Record of Decision:

T.H. AGRICULTURE & NUTRITION CO.
(MONTGOMERY PLANT)
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MONTGOMERY, AL
09/28/1998

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RECORD OF DECISION

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

T H AGRICULTURE & NUTRITI0N SITE

OPERABLE UNIT TWO

MONTGOMERY, MONTGOMERY COUNTY, ALABAMA

PREPARED BY

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION IV

ATLANTA, GEORGIA

DECLARATION
of the
RECORD OF DECISION
OPERABLE UNIT TWO- FINAL GROUNDWATER ACTION
AND FINAL SOILS ACTION

SITE NAME LOCATION

T H Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the T H Agriculture & Nutrition (THAN) Site, Montgomery, Alabama, developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. Section 9601 et seq., and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the administrative record for the THAN site.

The State of Alabama, as represented by the Alabama Department of Environmental Management (ADEM), has been the support agency during the Remedial Investigation and Feasibility Study (RI/FS) process for the THAN site and concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare or the environment.

DESCRIPTION 0E SELECTED REMEDY

This remedial action is the final of two actions planned for this Site. The previous action is an interim groundwater action. This final action addresses the remaining principal threats posed by this Site by remediating the contaminated soils and sediments; furthermore, this action finalizes the interim groundwater action. The remedial action for soils involves the removal, biological treatment, and replacement of impacted soils and sediments.

The major components of the selected remedy for this remedial action include:

- Designation of the areal extent of contamination as a Corrective Action Management Unit (CAMU);
- Excavation of soil and sediment from those areas exceeding cleanup standards;
- Backfilling of the excavated areas;
- Biological treatment of the excavated soils and sediments until cleanup standards are met;
- Replacement of the treated soils and sediments onsite;
- Institutional controls which include fencing and deed restrictions limiting site use for industrial purposes only; and,

- Continuation of the interim remedial action until the groundwater performance standards are met.

In addition, a contingent remedy is in place in case a determination is made that biological treatment is unable to meet the performance standards for soils and sediments in a timely manner. The contingent calls for removal and off-site disposal at an approved facility.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technology, to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Since the remedy chosen will result in hazardous substances remaining on-site above health-based levels (until groundwater performance standards are met), the five-year review will apply to this action. Thus, a review of the groundwater remedy should be conducted at five year intervals after the remedial action is begun; the purpose of this review will be to ensure that the remedy continues to provide adequate protection of human health and the environment.

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T H Agriculture a Nutrition Site
Montgomery, Alabama

1.0 SITE LOCATION AND DESCRIPTION

The T H Agriculture & Nutrition (THAN) Site is located on the west side of Montgomery, Alabama, about two miles south of the Alabama River and 1,600 feet west of Maxwell Air Force Base (Figure 1). Access to the Site is from U.S. Highway 31-82. The Site is basically flat and includes two properties: the THAN property and the Elf Atochem property. The Site covers 16.4 acres, with the THAN property covering about 11.6 acres and the Elf Atochem property covering 4.8 acres (Figure 2).

The only structure on the THAN property is a warehouse that was used for storing water treatment chemicals, plating chemicals, and agricultural chemicals. The remaining areas consist of mixed pine forest and a low, marshy area. The middle half of the Elf Atochem property has an operating area including a concrete paved area and a number of buildings. The area was formerly used for mixing, repackaging, and distributing agricultural and industrial chemicals. The east portion has an open parking area, and the west portion is an open area covered by grass and brush.

The land west of the Site was used for farming in the past. However, the land does not appear to have been actively farmed for a number of years. The property to the northwest is a mobile home park called Lakewood Estates (formerly Twin Lakes Community). Beyond the mobile home park is a small residential area. Undeveloped land covered by mixed forest, brush, and grass is on the north border. The entire area around the Site is zoned for general industrial use. A residential community lies about a mile southwest of the Site.

Wittichen Chemical Company first developed the THAN property as a sales, packaging, and storage facility for water treatment and plating chemicals. THAN, which was then known as Thompson Hayward Chemical Company, bought the facility in 1966 for storage and distribution of agricultural and industrial chemicals. THAN, a wholly owned subsidiary of Phillips Electronics North America Corporation, closed the facility in 1978 and leased it for various time periods before selling it in 1986 to Williamson Industries, Inc. THAN recently re-purchased this property from Williamson Industries.

The Elf Atochem property was first developed by Montgomery Industries. Elf Atochem North America, Inc., formerly known as Pennwalt Corporation, purchased this property in 1951 and used it as a chemical blending and distributing facility. Astro Packaging, Inc. bought the Elf Atochem property in 1979 and leased it to Industrial Chemicals. Elf Atochem now currently leases the property from Astro Packaging.

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2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

In October 1980, the Alabama Water Improvement Commission (AWIC) a predecessor to the Alabama Department of Environmental Management or ADEM) inspected the THAN property in connection with THAN's closing of its facility. During this inspection, AWIC found waste material in open and underground pits. In 1981, under the supervision of the Alabama Department of Public Health, Division of Solid & Hazardous Waste, THAN excavated waste and contaminated soil from 13 burial areas and collected contaminated groundwater, treated it, and discharged it to a publicly-owned treatment works (POTW).

In April 1986, THAN sold the THAN property to Williamson Industries, Inc. In August 1994, THAN purchased this property back from Williamson and is the current owner of this portion of the Site.

Elf Atochem, formerly known as Pennwalt Corporation, owned and operated a chemical formulation and distribution facility on its property which is adjacent to and up gradient from the THAN property. Elf Atochem handled substances similar to those handled by THAN. Elf Atochem maintained a 700,000-gallon evaporation lagoon on its property for the storage and treatment of wastewater. The Elf Atochem, property is currently owned by Astro Packaging, Inc. Astro Packaging leased it to Industrial Chemicals, Inc. (IC), until March 1994. IC operated a warehouse distribution center on the Elf Atochem, property. IC vacated the Elf Property in March 1994 and Elf Atochem currently leases it from Astro Packaging.

The THAN property was listed on the National Priority List in August of 1990. Thereafter, it was discovered that contamination from the Elf Atochem, property was impacting the THAN property and the Site was expanded to include both the THAN property and the Elf property.

In March 1991, Elf Atochem, agreed to perform the Remedial Investigation/Feasibility Study (RI/FS) pursuant to the terms of a consent order issued by EPA. This detailed study of Site contamination has been conducted under EPA oversight. This study included several phases and has investigated soil, surface water, sediment, groundwater, and air at the Site. Geophysical surveys and surface/subsurface soil sampling on an extensive grid system have been completed. A wetlands survey and an ecological assessment have also been completed. The results of the remedial investigation are in the information repository, located at the Montgomery County Public Library - Rufus Lewis Branch. In addition, numerous treatability studies and a focused feasibility study that concentrates on groundwater alternatives have been completed.

In April of 1995, the interim Action Record of Decision was issued for Operable Unit One (OUl). The Final Construction report for OUI was released in February 1998.

3.0 HIGHLIGHT OF COMMUNITY PARTICIPATION

EPA held an availability session at a local library at the start of field work in August, 1991. EPA chose the Air University Library at Maxwell Air Force Base as the local information repository because of its proximity to the Site. In March 1992, EPA held a public meeting at what is now Lakewood Estates Trailer Park to discuss the remedial investigation findings at the Site.

The proposed plan for the groundwater interim remedial action (OUl) was presented at a public meeting held on Tuesday, December 12, 1994 at the Hunter Station Community Center. Representatives from EPA attended the meeting and answered questions regarding the Site and the proposed plan. The administrative record for OUI was available to the public at both the information repository maintained at the Air University Library and at the EPA Region 4 Library located in Atlanta, Georgia. The notice of availability for both the OUl proposed plan and administrative record was published in the Montgomery Advertiser on December 9 and December 12, 1994. The public comment period on the OUI proposed plan was December 9, 1994 through January 9, 1995. EPA extended the comment period by thirty days to February 8, 1995, upon requests from the public. Subsequent to this proposed plan, an Interim Action Record of Decision was signed on April 17, 1995 summarizing the interim action for OU1. Responses to the significant comments received during that public comment period and at the public meeting were included in the Responsiveness Summary of the Interim Action ROD, and are not included again here.

The proposed plan for the final remedial actions for groundwater and soils (OU2) was presented to the public on August 13, 1998. Representatives from EPA also attended this meeting and answered questions regarding the Site and the OU2 proposed plan under consideration. The notice of availability for the OU2 proposed plan and the administrative record was published in the Montgomery Advertiser on August 4, 1998. The information repository was moved to the Rufus Lewis Branch Library based on public comments received in the past. The public comment period for the proposed plan was originally August 4, 1998 to September 4, 1998. However, a notice was placed in the Montgomery Advertiser on September 8, 1998 advising the public that the OU2 public comment period was extended to September 18, 1998. This extension was granted after it was found that the OU1 administrative record still resided at the Air University library; the OUl administrative record was subsequently moved to the Rufus Lewis Branch Library on August 19, 1998. Responses to the comments received during the OU2 public comment period and at the OU2 public meeting are included in the Responsiveness Summary of this decision document, in Appendix A.

This decision document presents the selected final remedial actions for soils and groundwater of the THAN Site, chosen in accordance with CERCLA, as amended by SARA, and the NCP. The decision for this Site is based on the administrative record. The requirements under Section 117 of CERCLA/SARA for public state participation have been met for both OUl and OU2.

4.0 SCOPE AND ROLE OF OPERABLE UNITS AND OVERALL SITE STRATEGY

EPA, has organized the work at this Superfund Site into two operable units (OUs). These units are:

- OU1: An interim remedial action for containment of groundwater contamination at the Site.

- OU2: The final action for the cleanup of the contamination in the soils, sediment, and groundwater at the Site.

Operable Unit One (OUl) encompasses the interim remedial action and involved the implementation of a multiple-well gathering and pump system to control and contain the contaminated groundwater plume. In addition, geological and engineering information on the aquifer's response to pumping will be obtained that will be used to determine the effectiveness of the design's hydraulic control. Data obtained during the remedial investigation indicates that there is contaminated groundwater within the unconfined surficial aquifer at the Site. This aquifer is classified in the Guideline for Ground-Water Classification Under EPA. Ground-Water Protection Stratgay, Final Draft, December 1986, as a Class II Groundwater, that is a current source of drinking water.

Operable Unit Two (OU2) encompasses the remediation of the contaminated soils and sediments on the Site, and also establishes the performance standards for the groundwater remedy. Upon reaching the cleanup standards for groundwater at an established point(s) of compliance, the groundwater pumping system will be shut down.

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 HYDROGEOLOGY/S0ILS

The Site is situated on Quaternary alluvial and terrace deposits consisting of sand, gravel, silt, and clay that were encountered from the surface to a depth of approximately 45 feet. Below these, an approximately 950 foot thick sequence of Cretaceous units extends to Paleozoic bedrock. The Cretaceous units include, in descending order, the Eutaw, Gordo, and Coker Formations, consisting of various sand, silt, and clay deposits.

Groundwater occurs in an unconfined surficial aquifer (Alluvial/Terrace Deposits aquifer) at the Site with the water table at approximately 15 feet below ground surface. Groundwater in the surficial aquifer flows generally toward the northwest at an average rate of approximately 0.28 feet per day. A potentiometric mound located north of the Site appears to direct some groundwater flow from the Site toward the northeast. Differences in head between nested monitoring wells at the Site indicate that groundwater also has a very small vertically downward component of flow within the aquifer.

The surficial aquifer is underlain at approximately 60 feet below ground surface by the approximately 60 foot thick Middle Eutaw confining unit. The top of the Middle Eutaw confining unit is characterized by a dense green clay layer, which is underlain by interbedded layers of sand and clay. Although a downward vertical gradient exists across this confining unit, the low permeability zones restrict vertical groundwater flow to an approximate rate of 4.3×10^{-5} feet per day. At this flow velocity, the most mobile constituents would require approximately 4,800 years to migrate from the surficial aquifer through the confining unit to the next deeper aquifer below.

Beneath the Middle Eutaw confining unit are three regional aquifers, as follows in descending order: Lower Eutaw aquifer, Gordo aquifer, and Coker aquifer. These aquifers are the source of groundwater for the City of Montgomery's West Well Field, which, at its nearest point, is 1.3 miles from the Site. Based on water levels reported from the West Well Field, as compared to water levels in one on-site well completed in the Lower Eutaw aquifer, groundwater in these deeper units most likely flows south, in the vicinity of the Site, toward the well field. However, these deeper aquifers are not believed to be affected by the Site at this time.

5.2 SURFACE WATER AND SEDIMENTS

Surface water near the Site includes Catoma Creek, located approximately 1.5 miles to the west-southwest; the Alabama River, located 2 miles to the north-northeast; and the West End Ditch, which is located approximately 2,000 feet east of the Site. Catoma Creek and the West End Ditch are tributaries of the Alabama River.

Surface water drainage on the THAN property is toward a small marshy area west of the warehouse into a small drainage ditch that parallels the western Site boundary and terminates at the southern Site boundary. This surface water is perched on low permeability soil (clay and silt) and may act as a minor recharge area for the Site. Water in the west ditch flows through a low point in the bank and then flows on an intermittent basis southwest through a combination of ditches and marshy areas.

Drainage from the eastern portion of the Site flows through storm drains into a ditch on the eastern boundary of the Site. Water in the ditch at times is pooled and stagnant, but during high water periods, flows south from the Site in the ditch. The ditch crosses under Highway 31-82 approximately 3,000 feet south of the Site. At that point, it flows east into the West End Ditch, which drains a large portion of western Montgomery. The storm sewer system that services a majority of the Elf Atochem property discharges to the east ditch at the outfall location. In addition, a much smaller drainage ditch east of U.S. Highway 31-82, which collects stormwater runoff from properties on that side of the highway, drains to the east ditch via three storm culverts in the vicinity of the Site.

5.3 NATURE AND EXTENT OF CONTAMINATION

In the following sections, reference is made to isoconcentration maps drawn to show the contaminant levels in the various media. The maps prepared for the RI (cited in Section 5.3.3.1

below) are oversize maps that are approximately 2 feet by 3 feet. The maps prepared for the "Supplemental Groundwater Investigation and Modeling in Support of the Supplement to the Focused Feasibility Study (OU1)" are 11" x 17". All of these maps are available for review in the appropriate documents as part of the Administrative Record, but are not included as part of this document, the OU2 ROD.

However, the isoconcentration map for the DDTr congeners (DDT, DDE, DDD) was digitized and has been included here as Figure 4.

Also, please note that semi-volatile compounds are not included as part of Tables 1 and 2. However, the semi-volatile sampling results were considered when defining the Contaminants of Concern (COCs, see Table 17 in Appendix C), discussed in Section 6.4.

5.3.1 GROUNDWATER

The groundwater monitoring system at the Site consists of 55 monitoring wells that have been installed during several phases. Thirty-one wells are screened across the water table in the uppermost portion of the surficial aquifer. Eighteen wells are screened across the lower portion of the surficial aquifer. Six deep wells are completed as follows: five are screened across the permeable zones of the Middle Eutaw confining unit, and the sixth is screened across the top of the Lower Eutaw aquifer. In addition to these 55 wells, there are two wells installed for the purpose of monitoring water levels (using piezometers).

Groundwater at the Site has been sampled on five separate occasions. The reports summarizing these results and the report dates are as follows:

- Phase I RI, June 1993: Twenty-five wells installed beginning in August 1991. Including six previously installed wells, each well was sampled twice for the entire range of parameters, or 158 constituents. Preliminary report delivered to EPA January, 1992.

- Phase II RI, June 1593: Twenty-four wells installed, with field work finished by June 1992. Along with four drinking water wells in the area, these wells were also sampled twice for the entire range of parameters.

  Extensive soil, sediment, and surface water sampling was also conducted during Phase I and II of the RI.

- Draft Supplemental RI, June 1994: Monitoring well MW-53 was installed. This well sampled several zones utilizing both temporary wells and Hydropunch technology, with the final completion of the well being screened across the permeable zones of the Middle Eutaw confining unit. This Draft Supplemental RI also collected 34 additional sediment samples that are discussed further in Section 5.3.3.

- Supplemental Groundwater Investigation and Modeling in Support of the Supplement to the Focused Feasibility Study (OU1), January 1997: Sampled all forty-eight wells in the monitoring system during January 1996; analyzed for pesticide, herbicide, volatile, and total metals constituents.

- October 1997: Sampled forty wells in the monitoring system for volatile, pesticide, and herbicide constituents.

The ROD written for OU1, dated April 17, 1995, and describing the Interim Remedy for groundwater, discusses in detail the groundwater sampling results of the Phase I and Phase II

RI. The OUl ROD went on to note that confirmed detection of constituents of interest was limited to the surficial aquifer, with the exception of samples from one deep well in the uppermost permeable zone of the Middle Eutaw confining unit. Low concentrations of constituents in this well are believed to have originated from seepage through a former deep water supply well located on the Site. The former water-supply well was abandoned during the RI.

The groundwater presentation made here for purposes of the OU2 ROD is shown on Table 1. Groundwater results from Phase I and Phase II of the RI are shown in columns 2 and 3 of Table 1, for only the pesticide, herbicide, and volatile compounds, and are part of the same results tabulated with the OU1 ROD. Frequency of detection and naximum levels detected are given for each constituent shown.

Groundwater results from the January 1996 sampling event (report dated January 1997) are shown in columns 4 (frequency of detection) and 5 (maximum level detected). Metals were analyzed also during this event, but are not shown on Table 1: none were above Maximum Contaminant Levels (MCLs).

Groundwater results from the October 1997 sampling event are shown in columns 6 (frequency of detection) and 7 (maximum level detected). Metals were not analyzed during this sampling event.

5.3.1.1 PHASE I, II RI GROUNDWATER RESULTS

The following three paragraphs are taken directly from the OU ROD (see pages 7 and 10 of that document) and discuss the pesticide, herbicide, volatile, and total metal results from RI groundwater sampling (refer to Table 1, columns 2 and 3). The shallow surficial water table (see Section 5.1 also) is approximately 45 feet thick. Wells were screened in this aquifer either across the upper interval, or across the bottom interval, i.e., just above the top of the Middle Eutaw confining unit. Wells in the shallow surficial aquifer are thus referred to as either "shallow" or "intermediate" wells.

Eighteen pesticide compounds (including multiple isomers of some compounds) and four herbicides were detected in the groundwater samples during the RI. In general, the most notable concentrations of pesticides and herbicides in the shallow wells occur in two distinct areas. One is located in the vicinity of the operations area at the Elf Atochem property and the other is located in the vicinity of the former THAN disposal area and the northeast corner of the THAN property. in contrast, pesticide concentrations in the intermediate wells are highest downgradient from these areas. The constituents of interest in the intermediate wells appear to be the downgradient extension of the detections in the shallow wells.

Twenty-one volatile organic compounds were identified as constituents of interest in the RI groundwater samples. The distribution of volatile organics in groundwater at the Site is very similar to that of pesticides. The highest concentrations of volatile organics occur in the shallow wells at or very near the operations area at the Elf Atochem property and the former THAN disposal area. As was the case with pesticides, the highest concentrations of volatiles in the intermediate wells occur within an area that includes the THAN property and extends downgradient in the aquifer. Therefore, the relationship of the distribution of volatiles between the upper and lower portion of the surficial aquifer is essentially the same as that for pesticides and for the same reasons.

Ten inorganics were retained as constituents of interest in groundwater from shallow and intermediate wells during the remedial investigation. There appears to be no discernible pattern of inorganic constituents in groundwater. Constituents of interest have been detected in groundwater on-site and in near-site areas in the surficial aquifer. The precise extent of affected groundwater is not entirely defined to the north, east and west. The furthest off-site detections of constituents of interest in groundwater were at wells MW-41S and MW-42I, located 600 feet north of the Site, and well MW-48I, 3,250 feet northwest of the Site.

Isoconcentration maps have been prepared for all the groundwater data collected during the RI, and are available for review as part of the Site's Administrative Record; they are not included here as part of this ROD for OU2 (see Section 5.3).

5.3.1.2 JANUARY, 1996 GROUNDWATER RESULTS

As noted above, all wells in the monitoring system were sampled again in January, 1996. Results from this sampling event are discussed in the "Supplemental Groundwater Investigation and Modeling in Support of the Supplement to the Focused Feasibility Study (OUI), January 1997", and are shown on Table 1, columns 4 and 5. Isoconcentration maps were also prepared for the groundwater data collected during this sampling event; however, they are part of the Site's Administrative Record and are not included here as part of the ROD for OU2 (see Section 5.3).

Table 1 shows only those constituents that were found in groundwater at levels exceeding drinking water standards, for the January, 1996 sample data (see Section 5.3.1 also).

Contaminant levels in the groundwater for this sampling event were found to be much lower than those levels documented during Phase I and Phase II of the RI. This is most likely due to natural attenuation, or biodegradation of the constituents within the aquifer rock, although it is also possible that migration and dilution of the contaminants away from the site has occurred.

5.3.1.3 OCTOBER, 1997 GROUNDWATER RESULTS

The groundwater monitoring system was sampled again in October 1997. Metals were not analyzed for, based on results of the previous sampling. Again, most constituents of concern were shown to be decreasing, although some compounds did show increased levels. Results are shown on Table 1, columns 6 and 7.

5.3.2 SOILS

Constituents of interest in soil appear to be due primarily to the presence of pesticides.. isoconcentration maps developed for pesticide groups, using data from the RI (these maps are part of the Administrative Record for OU2, and only Figure 4 for the DDTr congeners is included here- see section 5.3), indicate constituent presence in surface soils across portions of the Site, with limited presence to depth. BHC isomers were generally found in similar locations of the southwestern portion of the Site. DDD, DDE, and DDT constituents, as a group, were detected throughout portions of the Site (see Figure 4). Toxaphene, as well as other pesticides and herbicides, were detected at isolated locations on the Site. In general, pesticide concentrations were highest in the surface soil and concentrations decreased with increasing depth below the surface.

Isoconcentration maps were also presented in the RI for Total Volatile Organics (TVO) excluding acetone and methylene chloride (both of which appeared to be primarily related to sampling and/or laboratory artifacts). The TVO maps indicated constituent presence to depth, but only at low to moderate concentrations. The highest concentrations were detected in samples from four to six feet below the ground surface. The areas most affected on the Site were the operating areas that consist of the buildings and paved areas.

The results of the semi-volatile compounds analyses showed that they do not appear to be an issue at the Site. Semi-volatiles were detected in low concentrations and in a somewhat random pattern across the Site. The presence and concentration of semi-volatiles generally decreased from the surficial sample interval to deeper intervals.

Data for metals and cyanide establish that concentrations above background were limited mainly to the near surface soil (0 to 6 feet) in the vicinity of the THAN former disposal area on the west side of the property.

Table 2 shows frequency of detection and maximum levels detected, for those constituents on which performance standards are based, for all the soil samples collected during the RI. A detailed discussion of the constituents identified in the soil is included in Section 7.2 of the RI report.

See Section 5.3.4 for a discussion of dioxin results in soils.

5.3.3 SEDIMENTS

Sediment samples have been collected in two separate sampling events. During the RI, 127 sediment and 39 surface water samples were collected primarily onsite from drainage features. The Draft Supplemental RI documents the results of 34 additional sediment samples taken after the RI, primarily from off-site locations in order to document off-site migration of contaminants. Selected sediment samples were also analyzed for dioxin compounds, as discussed in Section 5.3.4.

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5.3.3.1 PHASE I, II REMEDIAL INVESTIGATION RESULTS

Analytical data for sediment samples from the drainage pathways associated with the Site indicated results similar to those for soil, although with fewer constituents of interest and at lower concentrations. Pesticides were detected in the majority of the samples. The detected pesticides were mainly concentrated in the east ditch (a manmade drainage structure) and to a lesser degree, the west ditch and marshy areas. Pesticide detection was highest in the east ditch samples and the storm culvert. Concentrations in both ditches and the marshy area substantially decrease with distance from the Site. In the ditches, pesticide concentrations were higher in surficial samples than in deeper samples.

Volatiles were detected sporadically and at relatively low concentrations. Herbicides and semi-volatiles were detected in few samples. The data from the RI and Supplemental RI show that frequencies of detection, average concentrations, and ranges of detected concentrations all decrease with increased distance from the Site. A detailed discussion of the constituents identified in the sediment is included in Section 9.3.2 of the Final RI Report. Table 2 shows the frequency of detection and maximum levels detected for all the sediment samples collected during the RI.

5.3.3.2 DRAFT SUPPLEMENTAL RI RESULTS

Subsequent to the RI, additional sediment sampling was conducted to delineate the extent of contaminant migration off-site via the surface water drainage pathway. A total of 34 samples were taken most were off-site on the southwest drainage pathway. One sample was taken in the east ditch to further delineate the contamination documented during the RI. In addition, five samples were analyzed for dioxin/furan compounds (see Section 5.3.4). Figure 2-1 and Table 2-2 from the Draft Supplemental RI are included here as part of Appendix D.

The results of this additional sediment sampling showed that contaminant levels dropped rapidly away from the site. The reason for this is that pesticides and herbicides bind tightly to soils and do not migrate easily. Most significantly, it was shown that contaminants were not impacting residential areas and were not impacting Catoma Creek. Although these results are not presented here as part of the OU2 ROD, a discussion of these results can be found in the Draft Supplemental RI, dated June 1994. In addition, it is noted that these additional sediment samples were considered when defining the areas A-E discussed in Section 5.3.6.

Table 2

Frequency of Detection and Maximum Concentrations for Constituents of Interest in Soils and Sediments

Phase I, II RI

T H Agricultural and Nutrition- Montgomery, AL

	SOILS		SEDIMENTS	
Constituent	# of Hits/ Total # of Samples	Maximum Detected Conc'n	# of Hits/ Total # of Samples	Maximum Detected Conc'n
4,4'-DDD	113/575	680	50/127	9,700
4,4'-DDE	165/575	160	76/127	2,200
4,4'-DDT	148/575	2,700	38/127	160,000
Toxaphene	22/575	4,400	2/127	83,000
2,4'-DDD	67/414	190	29/104	1,400
2,4'-DDE	58/414	41	15/104	2,400
2,4'-DDT	53/414	280	16/104	13,000
Lead	453/575	98	122/126	2,780
Arsenic	475/575	138	121/126	439

Note: All values shown above are in mg/kg (or parts per million).

5.3.4 DIOXINS

Dioxins and furans were also considered as a potential contaminant of concern. Dioxin analyses were performed in response to the infrequent detection of the herbicide 2,4,5-T in soil and sediment, since dioxins are a byproduct of the manufacture of 2,4,5-T and often occur in association with the herbicide. However, 2,4,5-T was detected in only one soil and one sediment sample (it was not detected in any other media).

Four soil samples were analyzed for dioxins during Phase II of the RI. The four soil samples were collected from the Wet Mix Area (see Section 6.2.2.4 of the RI) and from beneath the IC building extension (see Section 6.2.3 of the RI). In addition, one sediment from the storm culvert at N010-E805 was resampled for dioxin (the sediment location where 2,4,5-T was found).

During the Draft Supplemental RI sampling event, five off-site sediment samples were also analyzed for dioxins.

The results of these samples showed that dioxins and furans are not a concern at the site.

5.3.5 SURFACE WATER

Surface water samples were collected from the various drainage pathways associated with the Site. Analytical data indicated the presence of low concentrations of pesticides in only a few of the samples collected from the east ditch, the west ditch, and the marsh. Concentrations of most metals and cyanide were low and were generally consistent among the surface water samples with minor exceptions. No herbicides were detected. Volatiles and semi-volatiles were detected sporadically and at relatively low concentrations.

Surface water samples were also collected.from nearby ponds. These data showed that the Site had not impacted the ponds. A detailed discussion of the constituents identified in surface water is included in Section 9.3.2 of the Final RI Report.

5.3.6 BIOTA

As part of the Ecological Risk Assessment that was conducted for the Site, sampling was conducted to characterize the impact of Site contaminants on the environment. Biological samples were collected of prey species, including mosquitofish, sunfish, tadpoles, salamanders, worms, crayfish, grubs, dragonfly larvae, and snails. These samples were collected for tissue residue analysis to provide information for food web modeling. Tissue samples were collected from the East Ditch Reference location, East Ditch-Location 1, Area 1 Reference location, Area 1 Locations 1 and 2, Area 2 Location 1, and Area 3 Locations 1 and 2 (see Table 4-2 in Appendix D). These Areas were defined as part of the Draft Supplemental Remedial Investigation, and are also shown on Figure 2-1 in Appendix D. Areas 1 through 4 are located roughly equidistant along the drainage pathway that runs southwest from the Site to Catoma Creek.

Pesticide levels in the tissue samples analyzed decreased with distance away from the site. DDTr isomers were the most prevalent pesticides found in tissue samples, with the highest levels found in mosquitofish in the East Ditch.

5.3.7 SOILS/SEDIMENTS AREAS OF CONCERN

For convenience, contaminated soils and sediments were grouped into five separate areas for purposes of the Feasibility Study. These areas are referred to as Areas A,B,C,D, and E and are shown on Figure 3-2. These areas were used to generate volume estimates for the contaminated soils to be remediated. Figure 3-2 shows a total of 3900 cubic yards to be remediated, but actual volumes could range from 3000 to 5850 cubic yards, as noted in the Feasibility Study (see Section 7.0).

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6.0 SUMMARY OF SITE RISKS

A major risk that is currently associated with the Site is contamination in the groundwater. Ingestion of groundwater could result in exposure to various contaminants. Exposure to contaminated groundwater may result if wells are used or installed in a water-bearing zone that is contaminated. EPA's decision to initiate interim remedial action at this Site (see April 1995 ROD for OU1) was based upon data collected during the remedial investigation. That information indicated that hazardous substances released from this Site were migrating through groundwater. Primary contaminants of concern are pesticides, including delta-BHC, lindane, DDT, and chlordane; herbicides; volatile organic compounds, including trichlorethene and tetrachlorethene; and semi-volatile compounds. The interim remedial action was initiated in late 1997, is currently in place, and is expected to address the most imminent and substantial problem identified thus far at the Site. The groundwater will be extracted and released to the POTW until performance standards are met.

Soil and sediment contamination has been documented onsite and in the drainage pathways leading off the site. The remedy that has been selected for OU2 will address the risk posed to the public health and the environment by treating these contaminated soils/sediments, and if necessary, removing them off-site to an approved disposal facility.

As noted in Section 5.3.3.2, analytical data shows that the contamination documented at this site does not extend far enough to impact local rivers or streams.

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD for OU2, may present an imminent and substantial endangerment to public health, welfare, or the environment.

6.1 BASELINE RISK ASSESSMENT (BRA)

EPA has completed a formal baseline risk assessment (BRA, consisting of final document dated July 29, 1994 and as amended by subsequent addendums dated November 14, 1994 and September 5, 1995) for the Site, and has determined the current and potential threat to human health in the absence of any remedial action.

Tables from the BRA have been included as part of this Record of Decision as Appendix C, placed in numerical order for the reader's reference. A brief description is given below for each table, but only Table 15 will be discussed at length in Section 6.1.1.

Table 3 (Appendix C) shows the Reasonable maximum Exposure (RME) concentration calculated for each Contaminant of Potential Concern (COPC) found in soil samples. Tables 5, 6, and 7 show the RME concentrations for surface water, sediment, and groundwater, respectively.

Table 8 shows the standard intake factors that are used to calculate risk for each exposure pathway, for the onsite worker. Tables 9, 10, and 11 show the same information for site visitor, the hypothetical future child resident, and the hypothetical future adult resident.

Table 12 and 13 summarize the toxicological data for the COPCs associated with the site. Table 12 shows the cancer slope factors that are used to calculate risk for the carcinogenic COPCs. Table 13 shows the reference doses used to calculate hazards for the non-carcinogenic COPCs.

Table 14 presents the risk/hazard associated with the current land use for the onsite worker and the site visitor. Table 15 shows the risk/hazard associated with both a future industrial land use (onsite worker and site visitor) and a hypothetical residential land use (child resident, adult resident, and lifetime resident). Note that since the current land use is industrial, the information in Table 14 is identical to that in Table 15, for the onsite worker-and site visitor.

Table 17 shows the Contaminants of Concern (COCs) for each exposure pathway and receptor.

Tables C1 through C7 present example risk calculations.

6.1.1. HUMAN HEALTH RISK

Table 15 of the Baseline Risk Assessment (BRA) shows that the carcinogenic risk posed by the Site for the onsite worker is 4 x 10-5, whereas for the site visitor the carcinogenic risk was 3 x 10-5. This risk is within the carcinogenic risk range generally used for Superfund remedial cleanups. That carcinogenic risk range is 1 x 10-4 to 1 x 10-6. The Hazard Indices calculated for the current hazard were 0.5 and 1.3 for the onsite worker and site visitor, respectively, which are acceptable for non-carcinogens at Superfund remedial cleanups.

For a future hypothetical residential scenario, the total incremental cancer risk for a lifetime resident was found to be 2 x 10 -3. Likewise, the maximum Hazard Index was calculated for the lifetime resident and was found to be 78.

As noted, the risk to the onsite worker falls within Superfund's risk range for remedial cleanups, and does not in itself trigger a Superfund remedial action for the presumed industrial land use.

However, the Baseline Risk Assessment did not include a groundwater exposure pathway for the onsite worker. In addition, the exposure unit considered for purposes of calculating the Reasonable Maximum Exposure (RME) concentrations was assumed to be the entire Site, consisting of both the THAN and Elf Atochem properties. If the BRA had included a groundwater exposure for the onsite worker and/or had considered smaller exposure units (perhaps corresponding to Areas A-E on Figure 3-2), then the calculated risk/hazard to the onsite worker would have been much higher, thus providing a possible rationale for triggering Superfund's remedial action. The selected remedy addresses the remediation of the most highly contaminated areas of the Site, thus reducing the potential for future hypothetical exposure units to present an unacceptable risk/hazard for the onsite worker.

As noted in Section 9.0, the selected remedy includes institutional controls to be put in place limiting the future use of the Site to industrial purposes only. However, it should be noted that the remedy, when complete, may reduce site risks such that a residential land use may be protective of public health and the environment. Until the remedy is complete and the actual extent of cleanup is known, it is not possible to make this determination. The performance standards for soil and sediments are based on the current land use, which is industrial (see next section). The residual site risk will be re-assessed only when the remedy is concluded and if warranted, the need for institutional controls will be re-evaluated.

6.2 ANTICIPATED FUTURE LAND USE

Based on past and anticipated future use of this Site, and current zoning for the Site and the property adjacent to the south and southwest, the on-site worker is the most appropriate potential exposure scenario for this Site. The Site and the property immediately north and south along the Highway 31 (Birmingham Highway) corridor, and east on the opposite side of this corridor, are zoned for "general industry". Under this classification, various industries are permitted such as light industrial operations, etc.

USEPA OSWER Directive No. 9355.7-04 entitled, Land Use in the CERCLA Remedy Selection Process (USEPA, 1995), states that "while many Superfund sites have multiple uses, typically EPA expects that the vast majority of sites with current industrial/commercial uses will continue to be used as commercial or industrial sites". The directive further states "future industrial land use is likely to be a reasonable assumption where a site is currently used for industrial purposes, is located in an area where the surroundings are zoned for industrial use, and the comprehensive plan predicts the site will continue to be used for industrial purposes." All three of the prerequisites are met at the THAN site.

As discussed in the directive, the application of this directive may be most relevant where surface soil is the primary exposure pathway, which also is applicable to the Site.

6.3 ECOLOGICAL RISK

An ecological assessment has also been conducted to address the potential risks of site-related contaminants to ecological receptors, including the marsh/drainage areas portions of the Site (selected tables from this document are included as Appendix D). It is noted that the marshy area on the THAN property was not found to present an ecological risk, presumably due to the cleanup activity undertaken on the THAN property in 1981 (See Section 2.0).

As noted in Section 5.3.3.2, offsite sediment sampling indicated contaminant levels fall off rapidly along the drainage pathway leading south-southwest from the site. The Ecological Risk Assessment included community assessment studies, toxicity testing, and food-web modeling using contaminant concentrations from the tissue residue of prey items.

Community Assessment Results

Community assessment studies included evaluation of plant and macrobenthic communities for site related location and reference areas. The plant community analysis indicated a slightly greater species abundance, species richness, and species diversity present in the test areas as compared to the reference areas. The macroinvertebrate species analysis indicated similar average abundance, species richness, species diversity, and equatability and evenness between test and reference areas.

Toxicity Test Results

Toxicity tests were conducted using Ceriodaphnia dubia (48 hour elutriate test), Pimephales promelas, fathead minnow (48 hour elutriate test), Chironomus tentans, midge (ten day whole sediment assay), and Eisenia andri, earthworm (fourteen day soil assay). Results from the Ceriodaphnia test showed significantly lower survival in one (0 % survival) of the two East Ditch locations and one (50 % survival) of three from Area 3 (the drainage area between the Power Transmission Lines to Hunter Loop Road) compared to the appropriate reference locations. Results from the Pimephales bioassay showed significantly lower survival for both locations in the East Ditch (10 % and 83 % survival) and for two of three locations in Area 3 (30 % and 63 % survival) versus the appropriate control stations.

The Chironomus test showed low survival (0-14 %) including reference locations,. East Ditch locations show 0% and 4% survival versus 2% survival in the East Ditch Reference location. The Area 1 locations showed survival from 0% to 2% compared to 10% survival in the Area 1 Reference location. The Area 2 locations showed) 0% to 8% survival compared to 0% in the Area 2 Reference location. The Area 3 locations showed survival from 0% to 14%.

The Eisenia tests showed significantly lower survival in one Area 2 (the drainage area southwest of the facility between the Dirt Haul Road and the Power Transmission Lines) location (83%) and one Area 3 location (77%) compared to the Area 2 Reference location (100%).

Food-Web Modeling

The assessment endpoints related to the food-web modeling would be expected to be the more sensitive endpoints, given the mode of toxicity, and fate and transport of the site-related contaminants (organochlorine pesticides). The assessment endpoints evaluated were avian piscivores (fish-eating birds), avian insectivores, and mammalian omnivores. Prey item concentration, as well as abiotic media levels, are used as input parameters in the food web models to estimate exposure to ecological receptors.

The food web model (Procyon lotor, Raccoon) for the mammalian omnivore assessment endpoint showed no unacceptable risks for any location. The food web model (Butorides virescens, Green Heron) for the avian piscivore showed unacceptable risks for the East Ditch, Area 1 and Area 2. The food web model for the avian insectivore showed unacceptable risks for the East Ditch, Area 1 and Area 2 (see Table 4-6 in Appendix D).

6.4 CONTAMINANTS OF CONCERN (COCs)

Human Exposure

COCs for soils, sediments, and groundwater were identified in the BRA, using data from the RI, and are shown on Table 17 in Appendix C. These COCs were identified based on a carcinogenic risk of 10-6 and a Hazard Quotient of 0.1 for non-carcinogens. Using these criteria, the BRA identified 20 COCs in soil and 8 COCs in sediment, for a residential land use (adult and child resident). For an industrial land use (site visitor) there were 2 COCs for soil and 1 COC for sediment.

Table 1 shows the 18 compounds that were detected in groundwater at levels above drinking water standards during the January, 1996 sampling round. In addition to Maximum Contaminant Levels (MCL) set by EPA for drinking water, these standards include risk-based performance standards using a cancer risk of 10-5 for an adult resident.

Five of these compounds were found during the October, 1997 sampling round to have fallen to levels below drinking water standards. However, they are shown on Table 1 for purposes of illustrating the declining levels of these contaminants in the groundwater. For comparison, there were 23 compounds found in groundwater during the 1993 RI, at levels above drinking water standards.

Soil Levels Protective of Groundwater

In addition to the risk-based soil performance standards for inhalation, ingestion and dermal contact, soil clean-up levels (action levels) protective of ground water were calculated. These action levels are based on the prevention of soil leachate migration into ground water which would cause the ground water performance standard to be exceeded. Kay Wischkaemper's memo to Alan Yarbrough dated August 27, 1996 presents the development of these action levels. When site soil concentrations were compared to the action levels protective of ground water, delta-BHC was the only compound that could potentially pose a threat to ground water quality via leaching through soil. The maximum soil concentration detected at the site for delta-BHC was 200 mg/kg. The calculated action level for delta-BHC of 143 mg/kg would prevent the risk-based ground water performance standard shown in Table 1 from being exceeded (note that there is no Federal Maximum Contaminant Level, or MCL, for delta-BHC ... the performance standard is based on the risk-based performance standards calculated in the Risk Assessment for the site contaminants). Delta-BHC is not shown in the soil performance standard table; however, treatment of delta-BHC to the action level of 143 mg/kg will occur due to it's coexistence with other soil contaminants that will be in the body of soil/sediment treated in the in-situ biological cell(s).

Ecological

Finally, from an ecological perspective, hazard indices indicating unacceptable risks are driven by the DDT isomers 2,4'-DDD, 4,4' -DDD, and 4,4'-DDE. The food web models discussed in the previous section were back-calculated to determine Preliminary Ecological Sediment Values (PESVs) that would be protective for a given risk level (see Table 5-1 in Appendix D). Assuming a Hazard Quotient of 1.0, these PESVs ranged from 0.39 ppm, for 2, 4'-DDD; 0.023-0.19 ppm, for 4,4'-DDD; and 0.13-0.21 ppm for 4,4'-DDE (see Table 5-1 in Appendix D). These PESV values provide a starting point for the determination of ecological remedial goals for these COCs. Other information used in making the determination of the remedial goals may include: the distribution and concentration of the contaminants; the feasibility of remedial action including such factors as comparison to reference locations, the quantity and quality of the habitat destroyed by the remedial action and its ability to be restored; and the uncertainty associated with and the assumptions used for in the Ecological Risk Assessment.

Background values for COCs in offsite sediments are shown on Table 3-2 in Appendix 3-2. The 4,4-DDTr isomers were the only pesticides detected, and averaged up to 3.5 ppt, 15.3 ppt, and 1.9 ppt for 4,4'DDD, 4,4'-DDE, and 4,4'-DDT, respectively.

Table 2-2 in Appendix D shows the offsite sediment sample results obtained from the Supplemental Remedial Investigation, and provides a basis for comparison to the PESVs and the background levels found. As can be seen, pesticide levels fall off rapidly as you move along Area 1 towards Area 4, which borders Catoma Creek.

7.0 DESCRIPTION OF ALTERNATIVES FOR SOILS/SEDIMENTS REMEDIATION

Six alternatives for the remediation of contaminated soils and sediments at the THAN Site were evaluated in the Feasibility Study Report for Operable Unit Two (OU2), revised July, 1996. These six alternatives were listed in the Proposed Plan for OU2. These alternatives represent a range of distinct waste-management strategies addressing human health and environmental concerns. Although the selected remedial alternative will be further refined as necessary during the design phase, the analysis presented below reflects the fundamental components of the various alternatives considered feasible for this Site. Table 3 lists each alternative, along with implementation times and estimated costs.

As previously discussed in Section 5.3.6, and for the purpose of evaluating remedial alternatives, the volume estimates shown for each of the five areas (Areas "A", "B", "C", "D", and "E") on Figure 3-2 have been utilized. However, since one of the objectives of the FS is to provide an estimate of costs associated with a remedial action, a sensitivity analysis was performed with the objective of examining the upper and lower limits of soil and sediment that are expected to be remediated. The range of volumes given for a particular response action is intended to represent a "reasonable range" of impacted soil or sediment based on the number and location of samples collected during the RI, and the resulting areas delineated around these sample locations. For example, in areas where the sampling grid was more closely spaced, such as Areas "B", "C", and "D", the range used for volume estimates is expected to be narrower. However, in Areas "A" and "E", where sample locations are more spread out, the range used for volume estimates is greater due to fewer sample locations. Soil and sediment data summaries and isoconcentration maps presented in the Final RI Report (these maps are part of the Administrative Record for OU2, and are not included here- see section 5.3) were evaluated to estimate these areas. Therefore, the limits of a given area are defined by evaluating adjacent sample locations and their concentrations. The following detailed evaluations further addresses the estimated volume ranges, such that the impact of potentially higher remedial volumes will be reflected in the overall costs and evaluation of alternatives.

7.1 ALTERNATIVE NO. 1 - NO ACTION

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requires that a No Action alternative be evaluated as part of the screening process, in order to provide a baseline for comparison to other alternatives. Under this alternative for OU2, no further actions would be taken to address the soil and sediment at the Site. A review of the conditions at the Site would be performed at five-year intervals to evaluate whether the remedy is still protective of public health and the environment. Extraction and off-site treatment of groundwater would continue to be conducted in accordance with the groundwater remedial action.

7.2 ALTERNATIVE NO. 2 - INSTITUTIONAL CONTROLS

This alternative consists of the use of institutional controls, including deed or use restrictions and fencing and gates, implemented for the portion of the Site in which controls do not already exist and for areas off-site where soil and sediment concentrations exceed RGOs. A land deed and/or some other legal instrument that is normally examined during a title search would address the property to be controlled and will notify potential owners of the property. Institutional controls would also be used to notify workers of residual risks and/or restrict access/use of the Area. A 6 foot high chain link security fence would be installed along the western boundary of the THAN property, and would replace the existing barbed wire fence. In addition, deed or land use restrictions would be established for all five areas, and work protocols and signs would be setup for the two off-site areas.

Currently, existing Site controls include secured buildings and a fence, which consists of a six-foot chain link fence along the eastern, northern, and southern Site property boundaries, and along the western IC property boundary. The fence along the western and a portion of the northern THAN property boundary consists of three strands of barbed wire. With the exception of the existing egress from the Birmingham Highway, no other access exists for the Site.

Periodic site inspections and routine maintenance, which includes keeping the buildings secured and in good repair, would also be implemented. A soil and sediment monitoring plan will also be implemented and will consist of collection of a limited number of surface soil and/or sediment samples collected annually and analyzed for a focused list of constituents. Extraction and off-site treatment of groundwater would continue to be conducted in accordance with the groundwater remedial action. A review of the Site conditions would be performed at five-year intervals to evaluate whether the remedy is still protective of public health and the environment.

7.3 ALTERNATIVE NO. 3A/3B - ON-SITE CONSOLIDATION AND CONTAINMENT

This alternative includes the excavation of sediment from off-site areas, consolidation and containment of soil and sediment on-site, and the implementation of on-site institutional controls.

Removal of sediment from off-site Areas "A" and "E" and of soil from portions of Areas "B" and "D" would be followed by the consolidation of excavated material in the western corner of the IC property (Area C). A soil cover (Option A) or composite cap(Option B) would then be placed over the consolidated material to prevent direct contact and reduce infiltration. The portions of

Areas "B" and "D" requiring removal include the portions that lie off site and a portion that lies on site, but too close to the property boundaries to allow placement of the cover.

The estimated ranges of soil and sediment requiring excavation under Alternative No. 3 are as follows:

Area A:	300 to 600 cubic yards
Area B (a portion) :	275 to 525 cubic yards
Area D (a portion) :	40 to 75 cubic yards
Area E:	1,900 to 3,700 cubic yards

This results in a combined estimated range of 2,515 to 4,900 cubic yards (in place) to be excavated and consolidated on-site. This anticipated volume of excavated soil and sediment will require placement of an approximately 2- to 3-foot thick layer (excluding the cover) over 1 acre. The area proposed for consolidation is primarily Area C, plus portions of Areas B and D. This area of the Site is the most logical area to consolidate excavated material since some of the underlying soil (Areas "B", "C", and "D") exceeds RGOs. The consolidation area would require only minimal site preparation such as clearing and grading.

Removal of off-site soil or sediment would be performed using conventional construction equipment and methods such as an excavator and bulldozer. Excavated material would be transported by truck from Area "E" to the designated consolidation area. Depending on Site conditions at the time of sediment removal (i.e. precipitation, stormwater runoff, standing water, ability of soil to support heavy equipment, etc.), more specialized excavation equipment may be necessary. A temporary access road to and a soil berm around Area "A" may be necessary. These contingencies are reflected in the cost estimate. Subsequent to the completion of excavation, Areas "A" and "E" and the excavated off-site portions of Areas "B" and "D" would be backfilled with a clean fill from an off-site source, compacted, and then revegetated to provide adequate cover and reduce erosion.

Engineering considerations for the Site, especially in Areas "A" and "E", during removal operations include: protection of the excavation area during removal operations from stormwater by berming or shoring the area; maintenance of normal stormwater conveyance in the east ditch by phasing removal activities at Area "E" so that a limited portion is being excavated at any given time, or stormwater diversion; dewatering excavation areas by pumping incident precipitation entering the excavation into a temporary staging area prior to its discharge into the on-site sewer system; solids removal for stormwater which has entered the excavation area; limiting the disturbance of surrounding areas not designated for excavation which, in turn, would minimize constituent mobility and transport and unnecessary damage to the environment; and the conduct of ambient air monitoring during construction activities.

Upon consolidation of soil and sediment in the western corner of the IC property, a soil cover (Option A) or a composite cap(Option B) would be placed over the excavated material, then graded and vegetated to promote positive drainage and reduce infiltration. The area for consolidation and containment is shown on Figure 4-1. The two cover options proposed in this alternative consist of the following elements (from top to bottom):

Option A - Soil Cover (see Figure 4-2):

- 6 inches of topsoil with vegetative cover
- 6 inches of clean fill material overlying impacted soil and sediment

Option B - Composite Cover (see Figure 4-3):

- 6 inches of topsoil with vegetative cover
- 18 inches of fill

- geocomposite (geotextile and drainage layer (geonet) overlying geomembrane)
- 18 inches of soil that has a permeability no greater than 1 x 10 -5 cm/s

Engineering controls common to both cover options include: implementation and maintenance of erosion control measures by grading (minimum 5 percent) and establishing a vegetative cover (placement of an appropriate species of grass seed, fertilizer, and mulch); watering and maintenance necessary such that germination can reasonably be anticipated; and preventing run-on and runoff from eroding or damaging the final cover. Typical O&M activities include periodic inspection of the cover for cracks, adequate vegetative cover, integrity, and erosion; mowing; fertilizing/reseeding; and repair of damaged areas, as needed.

Institutional controls, similar to those discussed in Alternative No. 2, would be implemented for this alternative. Institutional controls for off-site areas would not be necessary. In addition, a six-foot high chain link security fence would be placed between the consolidated area and the rear of the IC building. This fence would restrict vehicles from gaining access. Post-closure land use of this area would not permit disturbance of the final cover. Extraction of groundwater would continue to be conducted in accordance with the groundwater remedial action. A review of Site conditions would be performed at five-year intervals to evaluate whether the remedy is still protective of public health and the environment.

7.4 ALTERNATIVE NO. 4A/4B - REMOVAL, THERMAL TREATMENT, AND REPLACEMENT

This alternative includes excavation from Areas "A", "B", "C", "D", and "E", on-site treatment with low temperature thermal desorption, and replacement of treated soil and sediment. Treatment of sediment and soil would be conducted at a central location from which equipment and material staging operations would be based. Depending on the moisture and physical characteristics of the soil and sediment, dewatering, mixing, and material sizing operations may be necessary prior to treatment.

Low temperature thermal desorption utilizes heat to volatilize constituents from soil, sediment, and sludge. Low temperature thermal desorption differs from incineration in that the former uses an indirect heat source and relatively small gas flows are used to desorb constituents from the affected media to a downstream unit for recovery or destruction, while the latter places the affected media directly in the heat source where the constituents are at least partially destroyed. The lower temperatures, typically 6005F to 1,0005F for thermal desorption compared to 1,5005F to 2,0005F for incineration, greatly reduce the energy costs, while the smaller gas flows reduce the off-gas treatment system costs.

Excavated soil is transferred from a stockpile to a feed system, typically consisting of a shredder and conveyor belt leading to a hopper, which delivers the soil to the thermal processor. Typically, soil is moved through the thermal processor by means of a heated screw through which hot oil circulates or, more commonly, a rotating dryer is used. Volatilized compounds are transported from the thermal unit to a gas treatment unit by a relatively low flow of gas that may be an inert gas such as nitrogen or partially deoxygenated air. Gas treatment may adsorption, or thermal oxidation. The soil is quenched in a jacketed screw or a pug mill with water to permit further handling.

Thermal desorption would involve on-site treatment of impacted soil and sediment at elevated temperatures. Commercial low temperature thermal desorption units are available from various vendors in sizes ranging from 5 tons per hour to 45 tons per hour.

Bench-scale treatability tests performed on impacted Site soil showed that overall removal efficiencies of constituents at a temperature of 8005F were good at 99.96 percent. The extent of removal of volatiles was also to be determined, however, it was realized that if performance with respect to pesticides was satisfactory, volatile constituents would be removed well below levels of potential interest. Upon treatment, excavated areas would be backfilled with the treated material, compacted, and revegetated. Post-treatment material handling (e.g., addition of water) may be required. Residuals and off-gases generated during treatment would be treated on site or condensed and transported off site for appropriate treatment. Upgrades for existing electric and natural gas connections may be required.

Volumes of soil and sediment potentially requiring excavation and treatment are estimated below and are shown on Figure 3-2:

Area A:	300 to 600 cubic yards
Area B:	575 to 1,125 cubic yards
Area C:	150 to 300 cubic yards
Area D:	75 to 150 cubic yards
Area E:	1,900 to 3,675 cubic yards

This results in a combined volume estimate ranging from 3,000 to 5,850 cubic yards (in place) requiring excavation and treatment. Processing requirements for the feed material may include dewatering via air drying, bar screening to remove debris, and a series of vibratory screening steps to reduce the material size. Weather and soil conditions resulting in more aggressive excavation and/or processing efforts will be reflected in the cost.

Institutional controls would be implemented as described for Alternative No. 2. The groundwater remedial action (OU1) and associated Site monitoring would continue. A review of Site conditions would-be performed at five-year intervals to evaluate whether the remedy is still protective of public health and the environment.

7.5 ALTERNATE NO. 5A/5B - REMOVAL, BIOLOGICAL TREATMENT, AND REPLACEMENT

This alternative includes excavation, consolidation, and on-site biological treatment using an aerobic/anaerobic process followed by replacement of treated soil and sediment. This particular process was considered in a Treatability Study Evaluation Report. This alternative considers ex-situ (Option A) and in-situ (option B) treatment applications. The areas/volumes of soil to be treated are identicai to that described in Alternative 4. Factors and considerations relative to removal of soil and sediment are also identical to those discussed for Alternative No. 4. Additional considerations for the ex-situ application include the immediate backfill and revegetation of areas to be excavated due to the potential extended time the soil and sediment would be undergoing treatment to meet Performance Standards. Treated soil will be subsequently placed on-site, graded, and revegetated to reduce erosion and infiltration.

The process under consideration alternately generates anaerobic and aerobic conditions. The anaerobic conditions result in dechlorination of the pesticides, while the aerobic conditions result in further degradation of the dechlorinated intermediates. The ex-situ process requires preparation of a reaction bed where the cyclic process can be conducted. Soil and sediment may be dewatered or mixed with a solid matrix that can support earth moving equipment. The soil and sediment is then placed on a lined and covered area to a depth of approximately two feet. Amendments are applied using a tractor-mounted rotary tiller. The tiller has an effective penetration of approximately two feet and serves to homogenize the amended soil and aerate the soil when aerobic or (oxic) conditions are required. When anaerobic (also known as anoxic) conditions are required, additional reagents and water are blended into the soil matrix and then a cover is placed over the soil matrix to minimize aeration. The amendments serve to reduce the oxidation/reduction potential and consume available oxygen. The added moisture mitigates against further intrusion of oxygen.

The in-situ process can also be conducted for the treatment of surficial soil or sediment. For the in-situ process, debris, rocks, etc. may require removal that is accomplished through the use of a subsurface ripper and/or agriculture rock picker. Due to the physical constraints, Areas "A" and "E" could be consolidated on-site over the portion of the Site that includes Areas "B", "C", and "D". The consolidated material would be placed in no more than a 1 foot thickness and the entire area would then be treated "in-situ".

Following each anaerobic/aerobic cycle, the effectiveness of the treatment process will be monitored. Chloride content is measured because it is a byproduct of dechlorination and can be utilized to confirm degradation is occurring. Moisture and pH are also measured to determine if soil/sediment matrix conditions are within acceptable limits. The process would continue until Performance Standards are met.

Under this alternative, institutional controls would be implemented as described for Alternative No. 2. Extraction and off-site treatment of groundwater would continue to be conducted in accordance with the groundwater remedial action for OU1. A review of Site conditions would be performed at five-year intervals to evaluate whether the remedy is still protective of public health and the environment.

7.6 ALTERNATIVE NO. 6 - REMOVAL AND OFF-SITE DISPOSAL

This alternative includes excavation and off-site disposal of impacted soil and sediment at a permitted waste facility. The volume of soil and sediment applicable to this alternative is identical to that presented for Alternative No. 3. Soil and sediment from Areas A, B, C, D, and E would be excavated, hauled to a central on-site location, dewatered (if necessary), and placed into over-the-road trucks for off-site transport. Excavated areas would be backfilled and revegetated to reduce erosion and infiltration. The material would be properly shipped in accordance with 29 CFR (Department of Transportation) shipping regulations. Depending on the moisture and physical characteristics of the soil and sediment, some additional material handling (such as dewatering) may be required prior to loading onto trucks for off-site transport. Dewatering operations would likely include pumping prior to excavation, followed by air drying, subsequent to excavation. Weather and soil conditions resulting in more aggressive excavation and/or dewatering efforts will be reflected in the cost.

The cost estimates for this alternative presume that characterization of the material excavated, as determined by the Toxicity Characteristic Leaching Procedure (TCLP), will show the majority of the material to be non-hazardous. As such, it is anticipated that most of the material would be sent to a Subtitle D landfill, with the remainder (soils/sediments that are characterized "hazardous waste" based on the TCLP test) being sent to a permitted hazardous waste facility.

Discussion of the "likelihood" that the excavated material passes or fails TCLP testing is somewhat premature and qualitative. However, a qualitative evaluation of site soil and sediment data has been performed, wherein the analytical database was queried for sample results that might be expected to fail a TCLP test. This data evaluation was based on levels detected, areal extent, and the soil adsorption characteristics of the contaminants of concern. The data evaluation showed that individual samples for the various constituents with concentrations that appear likely to exceed TCLP criteria were only seen sporadically in Areas A, B, C, D, and E, primarily in the surficial soil interval (0 to 1 feet) and in the sediment sampled within the storm sewer (included with Area E). However, considering the fact that the constituents evaluated strongly adsorb to soil and sediment, and the fact that the sample locations were sporadic and spread out, it is likely that most, if not all, of the soil would be nonhazardous once it is excavated and characterized.

Institutional controls would be implemented as described for Alternative No. 2. The groundwater remedial action (OU1) and associated Site monitoring would continue. A review of Site conditions would be performed at five-year intervals to evaluate whether the remedy is still protective of public health and the environment.

8.0 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES FOR SOILS/SEDIMENTS REMEDIATION

This section of the ROD provides the basis for determining which alternative provides the best balance with respect to the statutory balancing criteria in Section 121 of CERCLA and in Section 300.430 of the NCP. The major objective of the feasibility study was to develop, screen, and evaluate alternatives for the remediation of OU2 at the THAN site. The remedial alternatives selected from the screening process were evaluated using the following nine evaluation criteria:

- Overall protection of human health and the environment.
- Compliance with applicable and/or relevant Federal or State public health or environmental standards.
- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility, or volume of hazardous substances or contaminants.
- Short-term effectiveness, or the impacts a remedy might have on the community, workers, or the environment during the course of implementing it.
- Implementability, that is, the administrative or technical capacity to carry out the alternative.
- Cost-effectiveness considering costs for construction, operation and maintenance of the alternative over the life of the project, including additional costs should it fail.
- Acceptance by the State.
- Acceptance by the Community.

The NCP categorizes the nine criteria into three groups:

(1) Threshold Criteria - overall protection of human health and the environment and compliance with ARARs (or invoking a waiver) are threshold criteria that must be satisfied in order for an alternative to be eligible for selection;

(2) Primary Balancing Criteria - long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability, and cost are primary balancing factors used to weigh major trade-offs among alternative hazardous waste management strategies; and

(3) Modifying Criteria - state and community acceptance are modifying criteria that are formally taken into account after public comment is received on the proposed plan and incorporated in the ROD.

The selected alternative must meet the threshold criteria and comply with all ARARs or be granted a waiver for compliance with ARARs. Any alternative that does not satisfy both of these requirements is not eligible for selection. The Primary Balancing Criteria are the technical criteria upon which the detailed analysis is primarily based. The final two criteria, known as

Modifying Criteria, assess the public's and the state agency's acceptance of the alternative. Based on these final two criteria, EPA may modify aspects of a specific alternative.

The following sections provide a summary of the evaluation of alternatives for remediating soils/sediments under OU2 at the Site, for each of the criteria. A comparison is made between each of the alternatives for achievement of a specific criterion.

8.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Except for Alternative No. 1, each of the remedial alternatives provides some degree of protection of human health and the environment. However, Alternative No. 2 provides only a limited amount of protection over Alternative No. 1, and neither of these alternatives would satisfy this criteria for overall protection of human health and the environment. Each of the remaining alternatives would be adequate with respect to this criteria.

TABLE 3 - DESCRIPTION OF CLEANUP ALTERNATIVES-SOILS/SEDIMENTS

EPA evaluated six alternatives identified in the Feasibility Study (FS) for remediating contaminated soils and sediments related to the THAN Site. The following table lists each alternative, along with a short description, total present worth cost, and implementation time required. See Sections 7.1 through 7.6 of the FS for a complete discussion of each alternative. The only exception is Alternative 5, Option B: "Removal, Biological Treatment, and Replacement-Insitu". This alternative reflects a cost that was updated in June, 1998.

Alternative and Explanation	Total Cost $ Thousands	Implementation Time
ALTERNATIVE No. 1 - No Action The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requires that a No Action alternative be evaluated as part of the screening process, in order to provide a baseline for comparison to other alternatives. Under this alternative for OU2, no further actions would be taken to address the soil and sediment at the Site.	-0-	-0-
ALTERNATIVE No. 2 - Institutional Control This alternative consists of the use of institutional controls, including deed or use restrictions and fencing and gates, implemented for the portion of the Site in which controls do not already exist and for areas off-site where soil and sediment concentrations exceed Performance Standards. Periodic site inspections and routine maintenance would be performed.	220	-0-
ALTERNATIVE No. 3 - Onsite Consolidation and Containment This alternative includes the excavation of sediment from off-site areas, consolidation and containment of soil and sediment on-site, and the implementation of on-site institutional controls. Removal of sediment from off-site Areas "A" and "E" and of soil from portions of Areas "B" and "D" would be followed by the consolidation of excavated material in the western corner of the IC property (Area C). A soil cover (Option A) or composite cap (Option B) would then be placed over the consolidated material to prevent direct contact and reduce infiltration.	A: 567-1,326 B: 795-1,554	9-18 months
ALTERNATIVE No. 4 - Removal, Thermal Treatment, and Replacement This alternative includes excavation from Areas "A", "B", "C", "D", and "E", on-site treatment with low temperature thermal desorption, and replacement of treated soil and sediment. Treatment of sediment and soil would be conducted at a central location from which equipment and material staging operations wouldbe based. Depending on the moisture and physical characteristics of the soil and sediment, dewatering, mixing, and material sizing operations may be necessary prior to treatment.	1,911-3,574	12-17 months
ALTERNATIVE No. 5 - Removal Biological Treatment, and Replacement This alternative includes excavation, consolidation, and on-site (in situ or ex situ) biological treatment using an aerobic/anaerobic process followed by replacement (for ex situ option) of treated soil and sediment. This alternative considers ex-situ (Option A) and in-situ (Option B) treatment applications. The areas/volumes of soil to be treated are identical to that described in Alternative 4, as are factors and considerations relative to removal of soil and sediment. Additional considerations for the ex-situ application include the immediate backfill and revegetation of areas to be excavated due to the potential extended time the soil and sediment would be undergoing treatment to meet RGOs. Treated soil will be subsequently placed on-site, graded, and revegetated to reduce erosion and infiltration.	A: 1,181-2,637 B: 723-1,382	2-4 years
ALTERNATIVE No. 6. Removal and Off-site Disposal This alternative includes excavation and off-site disposal of impacted soils and sediments at a permitted waste facility (Subtitle D landfill for nonhazardous waste). The volume of soil and sediment applicable to this alternative is identical to that presented for Alternative No. 4. Soil and sediment from Areas "A", "B", "C", "D", and "E" would be excavated, hauled to a central on-site location, dewatered (if necessary), and placed into trucks for off-site transport. Excavated areas would be backfilled and revegetated to reduce erosion and infiltration. Final cost would vary according to how much material would be require disposal at a permitted hazardous waste facility.	845-1,889	10-12 months

8.2 COMPLIANCE WITH ARARS

Alternative Nos. 3, 4, and 5 would require designation of those areas exceeding performance standards as a corrective action management unit (CAMU), in order to comply with EPA's Resource Conservation and Recovery Act (RCRA) regulations with respect to land disposal restrictions (LDRs). Alternative No. 3B would meet the Alabama solid waste requirements for cover design for a waste characterized as non-hazardous; however, Option A would not. Each of Alternatives No. 3 through 6 would meet location- and action-specific ARARs such as meeting the substantive requirements for soil erosion and sedimentation for disturbed areas, stormwater discharge, applicable regulations for waste handling, etc. Alternative Nos. 4 and 5 would comply with all ARARs by reducing the levels of constituents of interest in soils to or below the performance standards.

The only alternatives that would not be adequate with respect to this criteria would be Alternatives No. 1, 2, and 3A.

8.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

With the exception of Alternative Nos. 1 and 2, each of the alternatives would provide good long-term effectiveness. However, some long-term effectiveness is realized by Alternative Nos. 1 and 2 due to natural attenuation and biodegradation. Alternative No. 3B would provide for a slight increase in long-term effectiveness over Option A since the benefits of synthetic materials include long-life and reliability. Alternative Nos. 4 and 5 provide the greatest long-term effectiveness for the soil and sediment which currently exceed performance standards. However, Alternative No. 6 does provide an equivalent long-term effectiveness relative to the site itself.

These comparisons of long-term effectiveness presume institutional controls will maintain an industrial land use for the Site.

8.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Based on treatability study results, Alternative No. 4 would provide for the greatest reduction of mobility and toxicity of impacted soils (followed closely by Alternative No. 5). Following Alternative Nos. 4 and 5, Alternative No. 6 provides the next best opportunity for reducing mobility, toxicity, and volume on the site. Alternative No. 3 provides reduction in mobility for all of the alternatives evaluated, but provides little reduction of toxicity and volume. Comparing options A and B of Alternative No. 3, slightly higher levels of reduction of mobility are provided by option B because of the more stringent containment components (i.e., synthetic liner). Alternative Nos. 1 and 2 do not provide any reduction of mobility, toxicity, or volume.

8.5 SHORT-TERM EFFECTIVENESS

With the exception of the Alternative No. 1, protection of human health and the environment would begin immediately upon completion of each alternative. The most favorable alternatives regarding short-term effectiveness are presented by Alternative Nos. 1 and 2, which require the least amount of material handling, can be implemented quickest, and result in the lowest amount of potential human and environmental exposure to Site constituents. The next most favorable situation is presented by Alternative No. 3, which would require a marginal increase in material handling and potential human and environmental exposure to Site constituents. For Alternative No. 3, there would be a noticeable difference between Option A and B, since the implementation period for Option B would increase, as would the potential for exposure. The next most favorable alternative would be No. 6, which would result in offsite disposal but which would entail excavation activities beforehand. The least favorable situation with regard to short-term effectiveness is created by Alternative No. 5 which provides the greatest amount of material handling, requires the longest implementation time, and therefore increases the potential human and environmental exposure to Site constituents. However, engineering process controls and on-site health and safety measures would be designed to address these potential short-term exposures. Please see the Responsiveness Suminary for EPA responses to issues 12 and 16.

8.6 IMPLEMENTABILITY

Each of the six alternatives evaluated are considered readily implementable. In order, Alternative Nos 1, 2, 6, 3A, 3B, 4, 5A, and 5B would provide an increasing degree of difficulty in implementation. The treatment alternatives, No. 4 and 5, will require more advanced equipment, facilities, and specialists for design, construction, and implementation. In addition, Alternative No. 5 will require pilot scale testing prior to implementation. The time required to implement each of the alternatives is also reflected by the order presented here.

8.7 COST

The cost estimate summary for the six alternatives is presented in Table 3. Total costs for each alternative include estimated capital costs, as well as associated O&M costs once the alternative has been implemented. In order to compare alternatives on an equal basis, the present worth of annual O&M costs was calculated for a period of 30 years at a 7 percent interest rate. All of the alternatives except for the No Action alternative (No. 1) have capital costs associated with implementation. Alternative 4 has the highest estimated capital cost range, while Alternative 2 has the lowest. Alternative 3B has the highest O&M cost. Based on the present worth of O&M costs, Alternative 4 is the most expensive while Alternative No. 1 (No Action) is the least expensive.

All costs shown on Table 3 are taken from the Feasibility Study for OU2, which was completed in 1996, except for Alternative 5, Option B, in-situ biological treatment. The costs for this option was updated in June, 1998, and reflected a lower cost due to increased experience with the technology. The corresponding costs for the ex-situ biological treatment, Option A, was not updated, since the increased cost of the ex-situ option was not considered justified (the original FS costs reflected a $619,000 dollar difference between ex-situ and in-situ treatment).

For the reader's reference, the following cost breakout is provided for each alternative, as a supplement to Table 3, where O&M represents annual operation and maintenance costs:

Alternative No./Description	Capital Cost ($)	O&M Cost ($/year)	Total Present Worth ($)
1 - No Action	0	0	0
2 - Institutional Controls	55,000	13,300	220,000
3A - On-site Consolidation and Containment - Soil Cover	478,000 - 1,237,000	7,200	567,000 - 1,326,000
3B - On-site Consolidation and Containment - Composite Cover	685,000 - 1,444,000	8,900	795,000 - 1,554,000
4 - Removal, Thermal Treatment, and Replacement	1,895,000 - 3,558,000	1,300	1,911,000 - 3,574,000

5A - Bioremediation (Ex-Situ) and Replacement	1,165,000 - 2,621,000	1,300	1,181,000 - 2,637,000
5B - Bioremediation (In-Situ) and Replacement	706,900 - 1,365,900	1,300	723,000 - 1,382,000
6 - Removal and Off-Site Disposal	829,000 - 1,873,000	1,300	845,000 - 1,889,000

a Present Worth = Capital Cost + (0&M x 12.409).

The cost ranges given for Alternatives 3-6 reflect the uncertainty associated with the exact amount of soils to be remediated (see Section 5.3.6). The high range reflects an assumed soil volume of 5,850 cubic yards to be treated.

It is noted here that the present worth cost for the groundwater remedy was documented in the Record of Decision (ROD) for OU1. The total cost for the groundwater remedy was $6,100,000, based on a capital cost of $1,305,000 and an annual O&M cost of 511,000 (the Present Worth factor assumed at that time was 9.384, based on a 10% interest rate, and has not been changed for purposes of this OU2 ROD). The actual cost associated with the groundwater remedy will depend on the number of years it takes to reach groundwater performance standards (see Section 9.1.1).

Thus, the total present worth cost associated with remediating both soils/sediments and groundwater is estimated at $7,482,000.

8.8 STATE ACCEPTANCE

The State of Alabama, as represented by the Alabama Department of Environmental Management (ADEM), has assisted in the Superfund process through the review of documents and submittal of comments. The State has reviewed the Proposed Plan and OU2 ROD and concurs with the selected remedy.

8.9 COMMUNITY ACCEPTANCE

Based on the comments expressed at the August 13, 1998 public meeting and recorded in the transcript thereof (no written comments were received during the comment period), the community in the vicinity of the site does not oppose the biological treatment of impacted soils and sediments, with a contingent remedy in place to have these soils and sediments removed and disposed off-site if necessary.

9.0 THE SELECTED REMEDY

Based upon CERCLA requirements, the NCP, the detailed analysis of alternatives, and public and state comments, EPA has determined that the activities as described in Alternative No. 4 (Removal, Biological Treatment, and Replacement, In-situ Option) constitute an appropriate remedial action for the Site. Alternative No. 6 (Removal and Off-site Disposal) will be the contingent remedy, and will be invoked as necessary and as discussed below. Institutional controls will be put in place that will limit the future use of the Site to industrial purposes only. Designation of the areal extent of contamination as a Corrective Action Management Unit (CAMU) will be necessary to comply with Resource Conservation and Recovery Act (RCRA) regulations with respect to land disposal restrictions.

There are four specific areas in which the contingent remedy can be invoked to help achieve an effective remediation for the Site.

The first has to do with the performance milestones being set for the biological treatment remedy. Although biological treatment as a remediation technology has matured within the last decade, there is still the risk that performance standards for soils and sediments will not be achieved in a timely manner.

For that reason, the following milestones are being set as part of this document so that EPA can invoke the contingent remedy, if it appears that biological treatment will be unable to reach performance standards:

Toxaphene:	50% destruction after 1 year
	Performance Standard after two years
DDT:	50% destruction after 1 year
	Performance Standard after two years

The times referenced above are understood to begin when the first cycle of the biological treatment process begins, after the pilot scale testing has ended. It is also understood that these milestones are to be used only at EPA's discretion when invoking the contingent remedy, and that operational factors will be considered as necessary and if warranted. These milestones are primarily in place to avoid a lengthy remedy taking years to complete, if contaminant levels slowly drop to performance standard levels. They are not intended to serve as a "trigger" for the contingent remedy.

Second, the contingent remedy can be used to remove off-site the most contaminated soils and sediments located within Areas A-E, as shown on Figure 3-2. This can be beneficial if longer treatment times can be avoided that would otherwise trigger the milestone criteria shown above. This possibility will be examined further during the design phase of the OU2 remedy and will be utilized as necessary.

Third, there is one sewer culvert location documented during the RI (sample location N010-E805) that showed high concentrations of contaminants. Although these sediments do not present a current risk to the surface soils (human health or ecological risks), groundwater, or surface water, the contingent remedy will be invoked to address these sediments, which are not part of Areas A-E shown on Figure 3-2.

Fourth, the contingent remedy can be used to address inorganic contamination at the Site. Arsenic and lead are inorganic compounds and are thus not affected by biological treatment. However, the N010-E805 sample location at the sewer culvert was the only location where arsenic was found at levels above its performance standard of 317 ppm. It is also the only location where lead was found above a presumed industrial standard of 1300 ppm (see Table 2). Thus, the contingent remedy would address the inorganic contamination, and at the same time remove the other highly elevated contaminants at the N010-E805 sample location.

The selected remedy also includes provision for continuing the interim groundwater remedy until groundwater performance standards are met.

As noted in Section 5.3.3.2, it was found during the off-facility sediment sampling that contaminant levels fall off rapidly along the drainage pathway leading south-southwest from the site. Nonetheless, there is a potential off-facility ecological risk along this drainage pathway (see Section 6.3), even though Catoma Creek is not impacted. The selected remedy will address those sediments adjacent to Area A shown on Figure 3-2 that are below the performance standards based on human exposure under an industrial land use, but yet still may present an unacceptable ecological risk along the drainage pathway leading from the Site. These sediments will be excavated and either consolidated into the biological treatment cell, or graded onto the Site since they will be beneath the performance standards for soils. The amount of impacted soil is not extensive, as can be seen by examination of Figure 4, Figure 3-2, and Table 2-2 in Appendix D. Although the ecological risk to some receptors may still remain above an acceptable Hazard Quotient after remediation based upon the soils performance standards given here, it is not considered feasible to remediate additional sediments along the drainage pathway, based on ecological risk concerns. This decision is also influenced by consideration of the habitat destruction that would occur with any excavation activities associated with remediation. Residual risks that remain after the biological treatment of the soils and sediments can be re-evaluated, if warranted, during the five-year review.

As noted in Section 8.7, the present worth cost for implementing the biological treatment remedy for soils and sediment was $1,382,000 assuming a soil volume of 5,850 cubic yards. The groundwater remedy has an associated present worth cost of $6,100,000. Total cost to implement both remedies is thus $7,482,000. These costs assume a 30 year life for O&M costs.

9.1 GROUNDWATER PERFORMANCE STANDARDS

Groundwater performance standards are based on drinking water standards, and include federal Maximum Contaminant Levels (MCLs) and Applicable or Relevant and Appropriate Requirements (ARARs), including State standards, and also may include risk-based performance standards.

Table 1 shows those compounds that were detected above drinking water standards during the January, 1996 sampling event. Highlighted on Table 1 are those compounds that continued to exceed drinking water standards during the October, 1997 sampling event. The MCLs and/or ARARs and/or risk-based performance standards shown on Table 1 for these compounds are thus the performance standards for groundwater. If future sampling determines that drinking water standards have been exceeded for other compounds besides, then they will also be added as a performance standard for purposes of this groundwater remedy.

9.1.1 AQUIFER RESPONSE AND PUMP TESTING

As discussed in the OU1 ROD, additional geological and engineering data is to be collected regarding the hydrogeologic properties of the surficial groundwater aquifer. Technical difficulties have prevented that data from being obtained as of August, 1998. However, it is noted that the construction of the groundwater remedy was completed in February, 1998, and that the pumping system itself is operational. The additional data will help determine if the system in place is capable of establishing hydraulic control to the point of compliance (POC), in addition to confirming how well the conceptual model of the aquifer fits the hydrogeological data.

Groundwater modeling has also been conducted in an attempt to predict how the aquifer will respond to the pumping system, as part of the Remedial Design for OU1. This groundwater modeling predicted that carbon tetrachloride, trichloroethene, and endrin would most likely drive the length of the cleanup action. It was found that the groundwater cleanup could last as long as 30 years, based on carbon tetrachloride reaching its Maximum Contaminant Level (MCL) in the lower portion of the surficial aquifer. However, due to the intrinsic attenuation that appears to be taking place due to biodegradation within the aquifer, it is unlikely that the groundwater remedy will actually require this long.

9.1.2 COMPLIANCE TESTING

As discussed in the ROD for OU1, groundwater monitoring shall be conducted quarterly at this Site for the first year following remedial action. After the first year of remedial action, periodic monitoring will continue to be conducted at least twice annually until the performance standards are met at the point of compliance (POC). The POC is being set at the property boundary. If performance standards beyond the POC have not been met at that time, then it will be necessary to establish that natural attenuation, or intrinsic biodegradation, will be capable of reaching the performance standards beyond the POC. If this is not possible, then the groundwater remedial design will have to be altered in order to do so.

9.2 SOILS/SEDIMENTS PERFOMANCE STANDARDS

Performance standards for both soils and sediments are shown on Table 4 below. Both the soils and the sediments will be treated as one unit after excavation. These performance standards are based upon a 10-5 risk level for carcinogenic compounds, and assume an industrial land use. The only exception is arsenic which assumes a 10-4 carcinogenic risk level based on non-cancer endpoints, bioavailability, and other uncertainties.

Table 4
Performance Standards for Soils/Sediments

Constitutent	Performance Standard
DDT	94
DDD	132
DDE	94
Arsenic	317
Toxaphene	29

Note: All values shown above are in mg/kg (or parts per million).

Arsenic is a natural occurring mineral that is considered by EPA to be a systemic (non-carcinogenic) toxicant and a human carcinogen. However, there is considerable uncertainty concerning its ability to cause cancer at low exposure levels, especially the less soluble form that occurs in contaminated soil. The Superfund program of EPA's Region 4 regulates arsenic in soil as a systemic toxicant for the purpose of deriving protective clean up levels. To be consistent with the NCP, EPA also requires soil clean up levels to fall within the protective cancer risk range of 10-6 to 10-4 for the most sensitive, likely receptor even though the calculated risk may be an overestimate. 317 mg/kg was chosen as the Remedial Goal for arsenic because it is within EPA's acceptable risk range and does not exceed a Hazard Quotient of 1.0 based on a worker exposure scenario."

Table 2 shows sampling results for each of the DDT, DDE, and DDD congeners, as was presented in the RI. However, it is noted here that the Table 4 performance standards represent total DDT, total DDE, and total DDD, i.e., there is no provision for separate congeners, since toxicological data would not support such a provision.

10.0 STATUTORY DETERMINATION

Under Section 121 of CERCLA, 42 U.S.C. º 9621, EPA must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

10.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy provides protection of human health and the environment by: eliminating, reducing, and controlling risk through engineering controls and/or institutional controls; and via soil/sediment and ground water treatment as delineated through the performance standards described in Section 9.0 - The Selected Remedy. The residual risk due to individual contaminants will be reduced to a probability of 1x10 -5 for carcinogens. The residual carcinogenic risk at the Site will be reduced to acceptable levels (i.e., cancer risk between 1x10 -6 and 1x10 -4) once performance standards are achieved. Implementation of this remedy will not pose unacceptable short-term risks or cross media impact.

10.2 ATTAINMENT OF THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

The selected remedy will comply with the substantive requirements of federal and state laws and regulations that have been determined to constitute applicable or relevant and appropriate requirements (ARARS).

Applicable requirements are those cleanup standards, control standards, and other-substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a Superfund site. Relevant and appropriate requirements are those cleanup standards, control standards, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable, address problems or situations sufficiently similar (relevant) to those encountered and are well-suited (appropriate) to circumstances at the particular site.

Safe Drinking Water Act, MCLs and MCLGs; Alabama's Primary Drinking Water Standards. The following is taken from the OU1 ROD, page 21 and 22, and applies equally here for purposes for OU2:

> "Maximum contaminant levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) promulgated under the authority of the Safe Drinking Water Act (SDWA) are specifically identified in Section 121 of CERCLA as well as the NCP as remedial action objectives for groundwater that is a current or potential source of drinking water supply. The groundwater underlying the THAN Site is classified as Class II A groundwater (i.e., potential sources of drinking water) under EPA's Guidelines for Ground-Water Classification. MCLs and non-zero MCLGs are therefore relevant and appropriate as final remedial action objectives for groundwater cleanup. Alabama's primary drinking water standards are also relevant and appropriate as final remedial action objectives for groundwater cleanup because they set standards for potential sources of drinking water."

Resource conservation and Recovery Act (RCRA); ADEM Hazardous Waste Regulations; ADEM Solid Waste Regulations. The following discussion is taken from the OU1 ROD, and applies equally here for purposes of OU2, with respect to groundwater:

> "The selected groundwater remedy involves the short term storage of contaminated groundwater before it is sent to the POTW for treatment and disposal. If the contaminated groundwater is RCRA characteristic hazardous waste, hazardous waste regulations which address storage units are applicable. If the contingent remedy for contaminated groundwater is implemented, which involves extraction, treatment and discharge at the Site by reinjection or infiltration,

hazardous waste regulations which involve treatment and storage units may likewise be applicable. Land disposal restrictions establish treatment standards which must be met before hazardous wastes may be land disposed. Land disposal restrictions are applicable if the contingent remedy for contaminated groundwater is implemented, the contaminated groundwater is RCRA characteristic hazardous waste, and treated groundwater is discharged at the Site by reinjection or infiltration. In such an event, the land disposal restrictions must be met before treated groundwater may be discharged. Any waste generated by the treatment process, such as sludges and filters, are subject to the waste characterization and disposal provisions of RCRA."

The selected remedly also involves the excavation, treatment, and replacement of contaminated soils and sediments. As such, the land disposal restrictions and other provisions of RCRA, as discussed above, are also applicable, and will require the designation of a Corrective Action Management Unit (CAMU).

Clean Water Act, Pretreatment Standards. The following discussion is taken from the OU1 ROD, and applies equally here for purposes of OU2, with respect to groundwater:

> "The general pretreatment regulations set forth in 40 C.F.R Part 403 addresses the introduction of pollutants into POTWs and are applicable to the selected interim remedy."

Safe Drinking Water Act, Underground Injection Control Regulations, as delegated to the State of Alabama. The following discussion is taken from the OU1 ROD, and applies equally here for purposes of OU2, with respect to groundwater:

> "If the contingent remedy for contaminated groundwater is implemented (as set forth in the OU1 ROD), and treated groundwater is discharged at the Site by reinjection or infiltration, the substantive requirements of the UIC program are applicable. See 40 CFR 147.50."

Alabama Regulations Governing Emissions of Pollutants to Air; Ambient Air Ouality Standards. If the contingent remedy for groundwater is invoked (see OUl ROD) and on-site treatment occurs, these standards are applicable because there will be emissions of air pollutants from the air stripper in ambient air. This applies also to the biological treatment remedy for soils and sediments.

Department of Transportation (DOT) Regulations and occupational Safety and Health Administration (OSHA) Regulations. While DOT and OSHA regulations do not fall within the technical definition of ARARs becausethey are not environmentally based, they are nonetheless directly applicable to the extent they address activities associated with the cleanup such as the transportation of hazardous materials and health and safety requirements for workers at the Site.

Waivers

Waivers are not anticipated at this Site at this time.

Other Guidance To Be Considered

Other Guidance To Be Considered (TBCs) include health-based advisories and guidance. TBCs have been utilized in estimating incremental cancer risk numbers for remedial activities at the Site and in determining RCRA applications to contaminated media.

10.3 COST EFFECTIVENESS

After evaluating all of the alternatives which satisfy the two threshold criteria (protection of human health and the environment, and attainment of ARARs), EPA has concluded that the selected remedy, Alternative 5B, affords the highest level of overall effectiveness proportional to its cost. Section 300.430(f)(1)(ii)(D) of the NCP also requires EPA to evaluate three out of five balancing criteria to determine overall effectiveness: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost-effective. The selected remedy provides for overall effectiveness in proportion to its cost.

The selected remedy is, with the exception of Alternative 1 (No Action), Alternative 2 (Institutional Controls), and Alternative 3A (Onsite Consolidation and Containment, Option A), the least expensive of the alternatives for this Site. Alternatives 1 and 2 do not satisfy the primary criteria. The selected remedy provides much better overall effectiveness than either Alternative 3A or 3B, for roughly the same cost. Although Alternative 4 does provide the highest degree of overall effectiveness, its much higher cost is not considered justified. The same applies to Alternative 5A, where a potentially modest increase in overall effectiveness does not justify its increased cost. The selected remedy will also reduce toxicity, mobility, or volume through treatment at a lower cost than Alternative 6, which provides no reductions in same.

The estimated present worth costs for the selected remedy is $7,482,000.

10.4 UTILIZATION OF PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the final remediation at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that Alternative 5B provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, and cost, while also considering the statutory preference for treatment as a principal element and consideration of state and community acceptance.

The selected remedy represents a permanent solution with respect to the principal threats posed by the Site.

10.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The selected remedy does utilize treatment as a principal element, for both groundwater and soils/sediments.

11.0 EXPLANATION OF SIGNIFICANT CHANGES

There have been no significant changes in the selected remedy from the preferred interim remedy described in the Proposed Plan.

APPENDIX A:

RESPONSIVENESS SUMMARY - T H AGRICULTURE & NUTRITION SITE

The Responsiveness Summary shows how EPA considered public comments made on the Final Remedial Action summarized herein as Operable Unit Two (OU2) for this Site. For additional reference, a transcript of the public meeting held August 13, 1998 is part of the Administrative Record for OU2. A copy of both the OU1 and OU2 Administrative Records is available for review at the information repository, which has been set up at the Montgomery County Library- Rufus Lewis Branch. No written comments were received during the public comment period for the OU2 Final Remedial Action. All issues identified were taken from the transcript referenced above.

1. Is the company that did the dumping being held accountable for the cost? Who's paying for it?

EPA Response:

Yes. Elf Atochem is the owner of the former Pennwalt facility, which is adjacent to the THAN facility. Prior to the Remedial Investigation (RI), Elf Atochem entered into an agreement with EPA to take the lead on the RI and Feasibility Study (RI/FS), and all RI/FS activities have been completed to date. The Site is thus referred to as a Potentially Responsible Parties lead, or PRP-lead site, as opposed to a Fund-lead site, where EPA would perform the work and seek reimbursement afterwards.

A separate Consent Decree will be negotiated with the Responsible Parties prior to enacting the Remedial Design and Remedial Action (RD/RA) for OU2.

2. Why are they taking so long to clean up?

EPA Response:

This Site was discovered on the CERCLA database in 1986. A Preliminary Assessment was done in 1987 and the Site Inspection was done in 1987 (PA/SI), Using information from the PA and SI, the Site was then placed on the National Priorities List (NPL) in 1990. A Consent Decree was negotiated with the PRPs prior to the Remedial Investigation (RI), which was finalized in 1993. Using data from the RI, a focused Feasibility Study was performed to support the first remedial action, Operable Unit One (OU1), which was put in place to address the groundwater contamination. The Record of Decision (ROD) for OU1 was signed in 1995. Construction was completed on the OU1 remedy in January, 1998. The final remedial action for the Site, or OU2, will begin Remedial Design after the ROD is signed.

It should be recognized that EPA does not exercise its remedial authority under CERCLA unless the site has been placed on the NPL.

In order to make an informed decision on the cleanup, studies to determine the nature and extent of contamination are necessary to ensure selection of the appropriate remedy for protection of human health and the environment.

3. There was a break in the water line in front of one of those plants up there a few years ago. And has the drinking water and/or water lines been tested?

EPA Response:

No. The Montgomery Water Works and Sanitary Sewer Board (MWWSSB) has been contacted regarding this issue. It was learned that a break in the water line did occur in 1990. The location of the break was about 200 feet north of the northeast corner of the THAN property, up in the woods. The line was plugged at the time near the THAN site, and service was restored from an alternate branch line. The section of line near the Site has not been used since.

However, there is little likelihood that residents' tap water has been contaminated by Site soils, for several reasons: first, the break did not occur in the vicinity of soil contamination at the Site (see Issue 20 also). Second, the water break results in water flowing outward and does not pull outside soils into the pipe. Third, it is not uncommon for sand and grit to accumulate in water lines and settle. When a break in the water line occurs, the suddenly increased water flow will, disturb the sand and grit inside the line,which will then show up initially in the tap water after service is resumed. . Last, the water line with the break has not been repaired to date, and service since the break has been provided from another water line branch.

However, EPA understands the concerns that the community may have with respect to their drinking water. Accordingly, at the community's request, plans have been made for EPA's field operations personnel to conduct testing of the drinking water, with samples to be taken at the tap from 2-3 homes. Plans are to have water samples taken on October 2. The Reverend Leon Henderson will be notified prior to field activities.

4. Have you found contamination on the ground and in the groundwater at the Site? Have you found whether the contaminated water is moving, and if so, where? Is it going to the river? Is it affecting inhabitants in the neighborhood?

EPA Response:

Contamination has been found in site soils, sediments, and groundwater. The remedial action undertaken as part of Operable Unit One (OU1) installed a pumping system that will keep contaminated groundwater from moving further off-site. However, Catoma Creek and the Alabama River are too far away to be impacted by groundwater from the Site. The community is not affected by the contaminated groundwater since their water is supplied by the City of Montgomery.

5. Where are we now? Are we going through the paperwork getting prepared for this, or are we in the process now of cleaning it up, and you're trying to determine how to clean it up?

EPA Response:

The proposed plan represents what EPA considers to be the best of the six remedies identified in the Feasibility Study for addressing soils and sediments. The preferred remedy is presented to the public in a public meeting in order to solicit comments from the public regarding the proposed remedy. This Record of Decision for OU2 was finalized only after the comments from the community were considered. Cleanup of the soils will begin after the Remedial Design and Remedial Action workplan are finished.

6. On those dots shown on your map, I assume those are testing areas that you have all around the area. You have some over on Hunter Loop Road and down by the trailer park. Do each one of those black dots show one of those testing spots where you're monitoring groundwater?

EPA Response:

No. The map presumably referred to is Figure 3-2 from the Feasibility Study, which was included in both the proposed plan and this Record of Decision. The black dots represent sample locations for soils and sediments that were used to define Areas A-E shown. These areas will be excavated and treated via the remedy set forth in this document. The groundwater monitoring consists of over 50 wells, and were not included on Figure 3-2.

7. You're saying you did pick up some (contamination) across Highway 31, and back toward old Maxwell field, but you didn't find any (contamination) coming down towards the trailer park? What about the runoff?

EPA Response:

There is no risk to the residents currently living in the vicinity of the Site via contamination from the Site.

Surface water runoff from the Site flows southwest over a relatively poorly defined drainage pathway. This drainage pathway runs towards Catoma Creek and not Maxwell Air Force Base. Residents of the Lakewood community live to the northwest of the Site, off of the drainage pathway leading from the Site. In addition, contaminant levels fall off rapidly away from the Site and are not impacting Catoma Creek. This is in large part due to the nature of the contaminants themselves, as pesticides tend to bind tightly to soils, as discussed on page 7 of the Proposed Plan factsheet that was mailed to the public.

8. Why don't we close down the Site until we we can get some (idea) of how long it will take to fix it and what (should be done)?

EPA Response:

Operable Unit Two (OU2) represents the final remedial action for the Site, and represents the selection of biological treatment as the preferred remedy for the soils and sediments; in addition, the groundwater remedy begun with OU1 will be continued until performance standards are met for groundwater. Both the THAN and Elf Atochem, properties are inactive at this time.

9. How long do you need?

EPA Response:

The implementation time for the preferred remedy of biological treatment is two to four years. This includes the time required for remedial design, during which pilot scale testing will be conducted (a bench scale treatability study has already been conducted as part of the Feasibility Study).

10. I was curious about how these places got to be called Superfund.

EPA Response:

The transcript shows the verbal response given at the public meeting, and provides an overview of the remedial process included as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), more commonly known as Superfund. CERCLA's remedial authority is used on sites placed on the National Priorities List (NPL). The THAN site was placed on the NPL in 1990.

Generally, CERCLA's remedial authority addresses long-term threats to the public health and the environment, such as contaminated groundwater. In addition, CERCLA provides EPA with removal authority, which can be used to address sites at which an imminent threat to the public health and the environment exists, such as leaking drums. Listing on the NPL is not required for EPA to exercise its remedial authority.

CERCLA was passed in 1980, in large part as a response to such sites as Love Canal in New York. It was intended to address abandoned hazardous waste sites across the nation, and the Fund set up by CERCLA to pay for the cleanups (with cost reimbursement sought afterward) became commonly known as Superfund.

11. What is involved in the biological treatment of the soil? What guarantee would we have that this biological treatment is not going to be hazardous in itself? Can you offer us any guarantee or warranty on the fact that this won't be worse than the problem that exists already? Will the treatment be hazardous to the residents?

EPA Response:

The biological treatment remedy will consist of soil amendments that will be added to the excavated soils and sediments, that will encourage the bacterial breakdown of the chlorinated contaminants in the soil. These soil amendments will include nutrients for the microorganisms. The process itself will involve a cycling procedure where each successive cycle will alternate between aerobic conditions (somewhat analogous to composting, requiring oxygen to be supplied via aeration) and anaerobic conditions. The aerobic cycles will break the chlorinated compounds, while the anaerobic cycles will further degrade the non-chlorinated intermediate breakdown products.
As part of the remedial design phase, pilot scale testing will be conducted on part of the excavated soils and sediments. These pilot tests will provide assurance that the biological treatment will be feasible (if pilot testing is not successful, the contingent remedy will be invoked).

Process controls will be put in place to control such factors as dust and surface water runoff, and will be explicitly included as part of the Remedial Design.

The chlorines that are part of the contaminants of concern will be released as non-toxic chloride gas as the biological degradation occurs. In fact, chloride gas will be monitored as an indicator that the degradation is occurring. Although the intermediate breakdown products of DDT (DDD and DDE) are also hazardous, DDD and DDE are included as part of the performance standards for the remedy.

Given all these factors, and given the case histories provided on previous sites on which this technology has been used, EPA feels that adequate safeguards will be part of this remedy, and that the contaminated soils and sediments can be treated successfully. If for whatever reason, these safeguards or performance standards cannot be met, then the contingent remedy of offsite disposal will be invoked.

12. How are you going to cover it? What type of material are you going to cover it with?

EPA Response:

During the anaerobic cycles of the biological treatment process, the soils and sediments being treated will be covered to reduce the amount of oxygen available to the microorganisms. During the aerobic cycles of the process, dust control may be achieved by either controlling the moisture content of the soils and sediments (i.e., wetting it down), or with a cover.

These engineering controls have not been determined at this time, but will be explicitly included as part of the Remedial Design to ensure that contamination will not migrate from the Site during implementation of the biological treatment remedy.

14. But the number one issue is that we shouldn't let them keep putting landfills in the community like this. We should have a law for that.

EPA Response:

There is no landfill located on the Site. Municipal landfills are regulated by local and State authorities, and are not addressed by the CERCLA program, unless they present an imminent and/or longterm threat to the public or the environment.

15. Where is it in writing as to what you're going to do?

EPA Response:

This Record of Decision represents the selection of the preferred remedy for final remedial action at the Site, and will become part of the Administrative Record (AR) for Operable Unit Two. The AR is available for public review at the Montgomery County Library, Rufus Lewis Branch.

16. How do you contain water?

EPA Response:

Operable Unit One (OU1) consisted of an interim remedy that was put in place to contain the groundwater plume existing under the site. It consists of a pumping system that pumps the groundwater and discharges it to the sewer line adjacent to the Site. This groundwater is then sent to the Public Owned Treatment Works (POTW), or sewage plant, for treatment. Pumping the groundwater out of the aquifer helps keep the contamination from moving underground away from the Site.

Containing the surface water runoff after the soils and sediments are excavated can be done by covering the treated area. This should be adequate during the anaerobic cycles of the biological treatment, since the soils must be covered during these cycles. For the aerobic cycles, a cover may still be feasible, or perhaps a berm could be built to contain the runoff water. These engineering controls have not been determined at this time, but will be included as part of the Remedial Design.

17. Who's to say that (contamination) has not exceeded that point during the 12 years that you've been out there trying to contain and eliminate this same problem?

EPA Response:

The Remedial Investigation (RI) was finalized in 1993. To some extent, it does represent a snapshot of site conditions, and it is possible that conditions have since changed. However, confirmatory sampling will be conducted as part of the excavation activities in the field. It is not expected that Areas A-E will have changed much since RI sampling was conducted (due to the binding characteristics of the contaminants, discussed earlier); however, the confirmatory sampling will ensure that all contaminated soils and sediments above performance standards will be collected and treated.

18. To what extent has the amount of chemical waste that was dumped in this area not been deteriorated by these microorganisms up there? Have you been able to measure how much of this chemical still remain in the soil, in and around this site in the hot spots?

EPA Response:

It is not thought that natural attenuation is occurring within the Site soils and sediments. Therefore, as discussed in the previous Response to Issue 17, the Remedial Investigation represents the last snapshot of Site conditions.

However, there is thought to be natural attenuation occurring in the groundwater, as evidenced by the declining levels of contaminants detected during previous groundwater sampling activities (see Table 1 of this Record of Decision).

19. According to the newspaper, it can only be used for industrialization purposes. Define "clean".

EPA Response:

The Remedy set forth in this Record of Decision (ROD) for Operable Unit 2 takes into account the industrial zoning of the Site, as designated by local planning authorities (see Section 6.2 of the ROD for more information on this issue).

The human health risk posed by any site is dependent upon exposure to hazardous constituents, and exposure is determined by assumptions based in part on a given land use. A residential exposure scenario would require a more protective standard than an industrial exposure scenario. However, it is important to recognize that the performance standards for soils and sediments, as set forth in this ROD, are still fully protective for the onsite worker under an industrial exposure scenario.

It is also important that the groundwater remediation is independent of these land use issues. The groundwater performance standards are based on drinking water standards, and are independent of anticipated land use.

20. Where is the water line, and is it situated anywhere in an area where you plan on digging?

EPA Response:

The water line runs parallel to U.S. Highway 31-82, approximately north-south. The location of the break in the water line, discussed earlier, was 200 feet north of the northeast corner of the THAN property. That location is not near the Areas A-E on Figure 3-2 that will be excavated. However, the water line does run adjacent to Area E that will be excavated.

It has come to EPA's understanding, after the public meeting was held, that this water line has not been in service since the break occurred in 1990. The Montgomery Water Works and Sanitary Board does plan to re-connect this line, but has no immediate plans to do so.

21. Now that you propose to clean it up, what are the news media going to do to help this community say "It's safe now. You can make a loan, etc"?

EPA Response:

EPA will continue issue factsheets to the mailing list set up for the Site. This mailing list includes members of the community and the news media. These factsheets will keep the public informed of progress made regarding cleaning up the Site.

22. And who's monitoring this cleanup and where is it being kept?

EPA Response:

The Site is being cleaned up by the companies that own the two adjacent properties. EPA has its own contractor that provides oversight for the activities undertaken by these companies, and that contractor was present at the public meeting August 13, 1998. In addition, EPA can use its own field operations personnel, located in EPA's Science and Ecosystem Support Division (SESD), to split samples and provide quality control support during future sampling activities.

The Administrative Record for both operable Unit One and Operable Unit Two (OU1, OU2) are kept at the Montgomery County Library, Rufus Lewis Branch, and are available for public review. These Administrative Records include all documents and information that EPA used to select the preferred remedy for OU1 and OU2.

23. Eight months ago, I bought 15 acres of residential and commercial property and I just got my property tax in the mail, and all of a sudden it's worth $75,000 more than what I paid for it, and I haven't done anything to it.

EPA Response:

Property tax assessments are the jurisdiction of the local tax assessor, and are not addressed by EPA.

APPENDIX B
CONCURRENCE LETTERS

<IMG SRC 98068F>

Mr. Richard D. Green, Director
Waste Management Division
U.S. EPA, Region 4
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303-3104

Re: THAN Record of Decision

Dear Mr. Green:

The Department has reviewed the Proposed Plan and Draft Record of Decision for the Thompson-Hayward Agriculture and Nutrition (THAN) Superfund site in Montgomery, Alabama. Your staff has provided us with timely drafts of these documents, and has accepted our comments and suggestions. Based on our review, the proposed remedy, consisting of excavation, bioremediation of soils on-site, and replacement of treated soils, is acceptable to the Department. We therefore concur with the selected remedy.

If you have questions or comments regarding this matter, please contact Mr. Fred Barnes at 334-270-5646.

<IMG SRC 98068FA>

JWW/lb

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APPENDIX C

SELECTED TABLES FROM THE BASELINE RISK ASSESSMENT

The following tables are provided without page numbers, and were taken from the Baseline Risk Assessment, consisting of the final document dated July 29, 1994 and as amended by subsequent addendums dated November 14, 1994 and September 5,1995. Revised tables incorporated slow purge data for inorganic compounds :

Table 3
Table 5
Table 6
Table 7 (revised)
Table 8
Table 9
Table 10
Table 11
Table 12 (revised)
Table 13 (revised)
Table 14
Table 15 (revised)
Table 17 (revised)

Table 3
Reasonable Maximum Exposure Concentrations for Chemicals of Potential Concern in Soil
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

Chemical of Potential Concern	Mean of Transformed Data	Standard Deviation of data	H(Statistic from Table)	Sample Size (1)	UCL (mg/kg)	Maximum (mg/kg)	RME (mg/kg)
Aluminum	9.9	0.49	1.830	143	24200	59900	24200
Antimony	0.7	0.27	1.733	143	2.3	10	2.3
Arsenic	1.6	0.88	2.117	143	8.7	115	8.7
Barium	4.8	0.59	1.891	143	164	1480	164
Beryllium	0.0	0.54	1.830	143	1.3	2.3	1.3
Chromium	3.4	0.46	1.830	143	36	173	36
Lead	2.9	0.57	1.891	143	22.9	98	22.9
Manganese	6.5	0.98	2.205	143	1331	13200	1331
Vanadium	3.4	0.38	1.777	143	34	66	34
Benzo(a)anthracene	0.01	0.28	1.733	124	1.1	2.8	1.1
Benzo(a)pyrene	-0.1	0.46	1.830	124	1.1	3.9	1.1
bis(2-ethylhexyl)phthalate	-0.3	0.95	2.205	118	1.4	91	1.4
Dibenzo(a,h)anthracene	-0.02	0.37	1.777	124	1.1	0.5	0.5
Hexachlorobenzene	0.02	0.21	1.697	124	1.1	0.9	0.9
Indeno(1,2,3)pyrene	-0.04	0.45	1.830	124	1.1	2.6	1.1
2,3,7,8-TCDD-EQ	1.4	2.00	26.140	2	2E+024	0.00002	0.00002
alpha-BHC	2.1	1.86	2.997	143	0.1	23	0.1
beta-BHC	3.5	2.52	3.920	143	1.7	40	1.7
delta-BHC	3.1	1.79	2.997	143	0.2	200	0.2
gamma-BHC (lindane)	3.1	1.78	2.997	143	0.2	52	0.2
alpha-Chlordane	2.2	1.80	2.997	143	0.1	5.3	0.1
gamma-Chlordane	2.2	1.87	2.997	143	0.1	8	0.1
2,4'-DDD	4.1	2.76	4.569	99	9.5	190	9.5
2,4'-DDE	3.3	2.52	3.920	99	1.7	41	1.7
2,4'-DDT	3.8	2.43	3.920	99	2.4	280	2.4
4,4'-DDD	4.5	2.93	4.569	143	20.1	680	20.1
4,4'-DDE	4.8	2.85	4.569	143	21.7	160	21.7
4,4'-DDT	5.1	3.33	5.233	142	179.5	2700	179.5
Dieldrin	3.6	1.82	2.997	143	0.3	59	0.3
Endrin	3.3	2.24	3.295	143	0.6	60	0.6
Endrin aldehyde	3.6	1.37	2.447	143	0.1	3	0.1
Endrin ketone	2.6	1.55	2.713	143	0.1	14	0.1
Heptachlor epoxide	3.2	1.49	2.713	143	0.1	4.6	0.1
Toxaphene	7.2	1.52	2.713	143	6.0	4400	6.0

(1). Sample size based on number of usable results. Invalid results were not counted.

2,3,7,8-TCDD-EQ: Combined toxicity of all dibenzodioxin and dibenzofuran congeners
UCL: Upper Confidence Limit
SQL: Sample Quantitation Limit
Maximum: The highest detected concentration.
RME: Reasonable Maximum Exposure (UCL or maximum when UCL is greater than maximum)

Table 5
Reasonable Maximum Exposure Concentrations for
Chemicals of Potential Concern in Surface Water
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

Chemical of Potential Concern	Mean of Transformed Data	Standard Deviation of data	H(Statistic from Table)	Sample Size (1)	UCL (ug/L)	Maximum (ug/L)	RME (ug/L)
Aluminum	8.8	1.12	2.423	35	19416	63200	19416
Arsenic	2.2	1.04	2.423	39	23	68	23
Barium	4.7	0.76	2.202	38	187	754	187
Beryllium	-0.6	0.36	1.856	39	0.7	2.0	0.7
Cadmium	0.5	0.54	1.928	38	2.2	42	2.2
Chromium	3.4	0.92	2.432	18	82	130	82
Lead	2.2	1.48	3.077	31	63	137	63
Manganese	6.5	1.70	3.437	37	7153	6100	6100
Thallium	-0.2	0.78	2.202	33	1.6	3.9	1.6
Vanadium	2.0	1.09	2.423	39	21	77	21
Benzene	-0.7	0.16	1.742	39	0.55	1	0.55
Carbon Disulfide	0.6	1.25	2.737	39	6.7	51	6.7
1,4-Dichlorobenzene	-0.7	0.21	1.742	39	0.56	1.8	0.56
Toluene	0.7	2.26	5.013	25	247	190	190
Benzo(b)fluoranthene	-0.1	0.52	1.928	38	1.2	0.1	0.1
Bis(2-ethylhexyl)phthalate	0.3	0.77	3.155	9	4.1	10	4.1
4-Methylphenol	2.0	0.93	2.310	39	16.3	210	16.3
Nitrobenzene	0.0	0.08	1.701	39	1.0	1.6	1.0
alpha-BHC	-4.1	1.48	3.077	39	0.10	0.45	0.10
beta-BHC	-2.7	2.12	3.812	39	2.3	9.4	2.3
delta-BHC	-2.9	1.69	3.437	39	0.6	4.5	0.6
gamma-BHC (lindane)	-3.2	1.22	2.737	39	0.15	0.35	0.15
alpha-Clordane	-4.4	1.18	2.737	39	0.04	0.13	0.04
gamma-Clordane	-4.4	1.25	2.737	39	0.05	0.18	0.05
2,4-D	1.8	0.16	1.771	23	6.7	13	6.7
2,4-DDD	-2.9	1.42	3.077	28	0.4	1.3	0.4
2,4'-DDE	-4.1	0.81	2.202	28	0.03	0.15	0.03
4,4'-DDD	-1.4	2.54	4.588	39	40.5	180	40.5
4,4'-DDE	-2.3	2.27	4.588	39	7.3	14	7.3
4,4'-DDT	-2.5	1.76	3.437	39	1.1	5.5	1.1
Dieldrin	-3.0	1.34	2.737	39	0.2	1.2	0.2
Heptachlor	-3.7	1.30	2.737	39	0.10	0.84	0.10

(1). Sample size based on number of usable results. Invalid results were not counted.

UCL: Upper Confidence Limit
SQL: Sample Quantitation Limit
Maximum: The highest detected concentration.
RME: Reasonable Maximum Exposure (UCL or maximum when UCL is greater than maximum)

Table 6
Reasonable Maximum Exposure Concentrations for Chemicals of Potential Concern in Sediment
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

Chemical of Potential Concern	Mean of Transformed Data	Standard Deviation of data	H(Statistic from Table)	Sample Size (1)	UCL (mg/kg)	Maximum (mg/kg)	RME (mg/kg)
Aluminum	9.8	1.35	2.447	85	63140	72300	63140
Antimony	0.9	0.75	2.035	85	3.9	88	3.9
Arsenic	2.0	1.27	2.447	85	24.3	439	24.3
Beryllium	-0.0	0.72	1.960	85	1.5	2.2	1.5
Cadmium	-0.1	0.59	1.891	85	0.5	10	0.5
Chromium	3.5	1.08	2.205	85	80.4	496	80.4
Copper	3.0	1.0	2.205	85	41	2700	41
Lead	3.6	1.02	2.205	85	76.0	2780	76.0
Manganese	6.0	1.42	2.713	85	1650	5980	1650
Mercury	-2.9	0.58	1.891	85	0.1	2.7	0.1
Thallium	1.2	0.21	1.697	85	3	9	3
Vanadium	3.3	0.9	2.117	85	50	77	50
Benzo(a)anthracene	0.0	0.32	1.733	85	1.0	1.0	1.0
Benzo(a)pyrene	-0.0	0.56	1.891	85	1.3	1.0	1.0
Bis(2-ethylhexyl)phthalate	-0.1	0.92	2.117	85	1.6	110	1.6
Dibenzo(a,h)anthracene	0.0	0.38	1.777	85	1.1	0.3	0.3
Hexachlorobenzene	0.0	0.37	1.777	85	1.2	29	1.2
Hexachlorobutadiene	0.0	0.27	1.793	85	1.1	12	1.1
2,3,7,8-TCDD-EQ	NA	NA	NA	1	NA	NA	0.0000121
1,2,4-Trichlorobenzene	0.1	0.73	1.96	85	1.7	310	1.7
alpha-BHC	2.0	2.23	3.295	86	0.2	2400	0.2
beta-BHC	2.9	2.41	3.920	86	0.9	1100	0.9
delta-BHC	3.1	2.16	3.295	86	0.5	1900	0.5
gamma-BHC (lindane)	3.1	2.26	3.920	86	0.7	10000	0.7
alpha-Chlordane	2.6	2.31	3.920	86	0.5	35	0.5
gamma-Chlordane	2.6	2.31	3.920	86	0.5	19	0.5

2,4'-DDD	4.3	3.01	4.569	63	38.3	1400	38.3
2,4'-DDE	3.1	2.78	4.569	63	5.4	2400	5.4
2,4'-DDT	3.7	2.63	3.920	63	5.0	13000	5.0
4,4'-DDD	5.0	3.42	5.233	86	375.0	9700	375.0
4,4'-DDE	5.3	3.07	4.569	86	107.8	2200	107.8
4,4'-DDT	4.4	3.22	4.569	86	76.1	160000	76.1
Dieldrin	3.4	1.86	2.997	86	0.3	0.12	0.12
Endrin	2.8	2.25	3.920	86	0.5	2100	0.5
Heptachlor epoxide	3.3	1.92	3.295	86	0.3	1.2	0.3
Toxaphene	7.4	2.01	3.295	86	24.2	83000	24.2

(1). Sample size based on number of usable results. Invalid results were not counted.

2.3.7,8-TCDD-EQ: Combined toxicity of all dibenzodioxin and dibenzofuran congeners
UCL: Upper Confidence Limit
SQL: Sample Quantitation Limit
Maximum: The highest detected concentration.
RME: Reasonable Maximum Exposure (UCL or maximum when UCL is greater than maximum)

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Table 8
Intake Factors for Onsite Worker
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

PARAMETER	UNITS	VALUE	SOURCE
BODY WEIGHT	kg	70	1,2
EXPOSURE FREQUENCY	days/year	250	1
EXPOSURE DURATION	years	25	1
INHALATION RATE	m 3/day	20	1
SOILS INGESTION RATE	mg/day	50	1
SKIN SURFACE AREA cm 2/day	2,000	2	
SOIL/SKIN ADHERENCE FACTOR	mg/cm 2	1.0	3
ABSORPTION FACTOR	unitless	0.01(organic compounds) 0.001(inorganic compounds)	3
NONCARCINOGENIC AVERAGING TIME	days	9,125	4
CARCINOGENIC AVERAGING TIME	days	25,550	4
CONVERSION FACTOR	kg/mg	1/1,000,000	

1. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" (EPA, 1991b)
2. Exposure Factors Handbook (EPA, 1989b)
3. Region IV Guidance (EPA, 1991a)
4. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part A), Interim Final (EPA, 1989a)

Table 9
Intake Factors for Site Visitor
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

PARAMETER	UNITS	VALUE	SOURCE
BODY WEIGHT	kg	45	4
EXPOSURE FREQUENCY ONSITE	visits/year	78	4
EXPOSURE FREQUENCY CREEK	visits/year	15	4
EXPOSURE DURATION	years	10	4
INHALATION RATE	m 3/day	20	3
SOILS INGESTION RATE	mg/day	100	4
SEDIMENT INGESTION RATE	mg/day	100	4
SURFACE WATER INGESTION RATE	L/hr	0.05	2
EXPOSURE TIME IN SURFACE WATER	hours/visit	2	4
SKIN SURFACE AREA	cm 2/visit	5,300	4
SOIL/SKIN ADHERENCE FACTOR	mg/cm 2	1.0	1
ABSORPTION FACTOR	unitless,	0.01 (for organics) 0.001 (for inorganics)	1

Table 9 (continued)
Intake Factors for Site Visitor
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

PARAMETER	UNITS	VALUE	SOURCE
PERMEABILITY CONSTANT	cm 2/hr	chemical specific	5
NONCARCINOGENIC AVERAGING TIME	days	3,650	2
CARCINOGENIC AVERAGING TIME	days	25,550	2
CONVERSION FACTOR	kg/mg	1/1,000,000	
CONVERSION FACTOR - LIQUID	L/cm 3	0.001	
CONVERSION FACTOR	mg/Ig	1/1,000	

1. Region IV Guidance (EPA, 1991a)
2. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part A), Interim Final (EPA, 1989a)
3. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" (EPA, 1991b)
4. Professional Judgment
5. Dermal Exposure Assessment: Principles and Applications, Office of Research and Development. January. (EPA, 1992b).

Table 10
Intake Factors for Child Hypothetical Future Resident
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

PARAMETER	UNITS	VALUE	SOURCE
BODY WEIGHT	kg	15	1
EXPOSURE FREQUENCY (CREEK)	visits/year	90	5
EXPOSURE FREQUENCY	days/year	350	1
EXPOSURE DURATION	years	6	2
INHALATION RATE	m 3/day	16	1
SOILS INGESTION RATE	mg/day	200	1
SEDIMENT INGESTION RATE	mg/day	100	5
SURFACE WATER INGESTION RATE	L/hour	0.05	4
EXPOSURE TIME (SURFACE WATER)	hours	2	5
SKIN SURFACE AREA	cm 2/day	5,000	3
SOIL/SKIN ADHERENCE FACTOR	mg/cm 2	1.0	1
ABSORPTION FACTOR	unitless	0.01(organic compounds) 0.001(inorganic compounds)	4
GROUNDWATER INGESTION RATE	L/day	1	3

Table 10 (continued)
Intake Factors for Child Hypothetical Future Resident
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

PARAMETER	UNITS	VALUE	SOURCE
PERMEABILITY CONSTANT	cm/hour	chemical specific	6
NONCARCINOGENIC AVERAGING TIME	days	2,190	2
CARCINOGENIC AVERAGING TMWE	days	25,550	2
CONVERSION FACTOR	kg/mg	1/1,000,000	
CONVERSION FACTOR - LIQUID	L/cm 3	0.001	

1. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" (EPA, 1991b)
2. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part A), Interim Final (EPA, 1989a)
3. Exposure Factors Handbook (EPA, 1989b)
4. Region IV Guidance (EPA, 1991a)
5. Professional Judgment
6. Dermal Exposure Assessment: Principles and Applications, Office of Research and Development. January. (EPA, 1992b).

Table 11
Intake Factors for Adult Hypothetical Future Resident
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

PARAMETER	UNITS	VALUE	SOURCE
BODY WEIGHT	kg	70	1
EXPOSURE FREQUENCY(CREEK)	visits/year	90	5
EXPOSURE FREQUENCY	days/year	350	1
EXPOSURE DURATION	years	24	2
INHALATION RATE	m 3/day	20	1
SOILS INGESTION RATE	mg/day	100	1
SEDIMENT INGESTION RATE	mg/day	100	5
SURFACE WATER INGESTION RATE	L/hour	0.05	4
EXPOSURE TIME IN SURFACE WATER	hours	2	5
SKIN SURFACE AREA	cm 2/day	5,300	3
SOIL/SKIN ADHERENCE FACTOR	mg/cm 2	1.0	1
ABSORPTION FACTOR	unitless	0.01(organic compounds) 0.001(inorganic compounds)	4

Table 11 (continued)
Intake Factors for Adult Hypothetical Future Resident
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

PARAMETER	UNITS	VALUE	SOURCE
PERMEABILITY CONSTANT	cm/hour	chemical specific	6
GROUNDWATER INGESTION RATE	L/day	2	1
NONCARCINOGENIC AVERAGING TIME	days	8,760	2
CARCINOGENIC AVERAGING TIME	days	25,550	2
CONVERSION FACTOR	kg/mg	1/1,000,000	
CONVERSION FACTOR - LIQUID	L/cm 3	0.001	

1. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" (EPA, 1991b)
2. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part A), Interim Final (EPA, 1989a)
3. Exposure Factors Handbook (EPA, 1989b)
4. Region IV Guidance (EPA, 1991a)
5. Professional Judgment
6. Dermal Exposure Assessment: Principles and Applications, Office of Research and Development. January. (EPA, 1992b).

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<IMG SRC 98068H>

Table 14
Summary of Cancer and Noncancer Risks by Exposure Route
Current Use Scenario
T.H. Agriculture & Nutrition Site
Montgomery, Montgomery County, Alabama

Exposure Route	Onsite Worker		Site Visitor	
	Cancer	HI	Cancer	HI
Inadvertent Ingestion of Soil	2E-005	0.3	9E-006	0.3
Dermal Contact with Soil	2E-005	0.2	8E-006	0.2
Inhalation of Dust	3E-008	0.00005	5E-009	0.00002
Inadvertent Ingestion of Surface Water	NA	NA	9E-007	0.1
Dermal Contact with Surface Water	NA	NA	1E-005	0.5
Inadvertent Ingestion of Sediment	NA	NA	3E-006	0.1
Dermal Contact with Sediment	NA	NA	3E-006	0.1
TOTAL CURRENT RISK	4E-005	0.5	3E-005	1.3

HI Hazard Index (noncancer risk)
NA Not Applicable

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<IMG SRC 98068K>
<IMG SRC 98068L>

APPENDIX D
SELECTED TABLES FROM THE ECOLOGICAL RISK ASSESSMENT
SELECTED MAP, TABLE FROM THE SUPPLEMENTAL RI

The following tables are provided without page numbers, and were taken from the Revised Ecological Risk Assessment, dated May 1995:

Table 3-2
Table 4-2
Table 4-6
Table 5-1

The following map and table are taken from the Draft Supplemental Remedial Investigation, dated June 1994:

Figure 2-1
Table 2-2

TABLE 3-2

REFERENCE AREAS SEDIMENT SAMPLES RESULTS a

THAN SITE
MONTGOMERY, ALABAMA

Constituent of Interest	Reference Area 1					Reference Area 2				Reference Area 3				Reference East Ditch
	6215 R1A	6216 R1B a	6217 R1C	6218 R1D	Arithmetic Mean b,c	6212 R2A	6213 R2B	6214 R2C	Arithmetic Mean b	6219 R3A	6220 R3B	6221 R3C	Arithmetic Mean b	6222 RED
Pesticides (ɪg/kg)														
alpha-BHC	0.33 U	0.33 U	0.33 U	0.33 U	-d	0.33 U	0.33 U	0.33 U	-	0.33 U	0.33 U	0.33 U	-	0.33 U
beta-BHC	0.67 U	0.67 U	0.67 U	0.67 U	-	0.67 U	0.67 U	0.67 U	-	0.67 U	0.67 U	0.67 U	-	0.67 U
gamma-BHC	1.0 U	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U	1.0 U	-	1.0 U
delta-BHC	1.0 U	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U	1.0 U	-	1.0 U	1.0 U	1.0 U	-	1.0 U
4,4'-DDD	4.4	7.2	1.5	3.4	3.1	1.7	3.2	1.3 U	1.9	2.3	1.3 U	7.4	3.5	1.3 U
4,4'-DDE	25	32	8.9	12	15.3	15	6.4	3.5	8.3	1.5	2.1	9.6	4.4	0.67 U
4,4'-DDT	4.4	1.3 U	1.3 U	1.3 U	1.9	1.3 U	1.3 U	1.3 U	-	1.3 U	1.3 U	2.5	1.3	1.3 U
2,4'-DDD	1.3 U	1.3 U	1.3 U	1.3 U	-	1.3 U	1.3 U	1.3 U	-	1.3 U	1.3 U	1.3 U	-	1.3 U
2,4'-DDE	0.67 U	0.67 U	0.67 U	0.67 U	-	0.67 U	0.67 U	0.67 U	-	0.67 U	0.67 U	0.67 U	-	0.67 U
2,4'-DDT	1.3 U	1.3 U	1.3 U	1.3 U	-	1.3 U	1.3 U	1.3 U	-	1.3 U	1.3 U	1.3 U	-	1.3 U
alpha-Chlordane	0.40 U	2.0 U	0.40 U	0.40 U	-	0.40 U	0.40 U	0.40 U	-	0.40 U	0.40 U	0.40 U	-	0.40 U
gamma-Chlordane	0.40 U	2.0 U	0.40 U	0.40 U	-	0.40 U	0.40 U	0.40 U	-	0.40 U	0.40 U	0.40 U	-	0.40 U
TOC (mg/kg)	13,000	78,000	22,000	24,000	20,000	78,000	38,000	15,000	44,000	23,000	33,000	37,000	31,000	2,600
% Solids	71.9	39.2	61.1	55.7	62.9	45.4	64.4	72.4	60.7	66.9	56.5	54.6	59.3	65.4
Sediment Texture														
% Gravel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.5	0.0	0.9	0.0	0.3	0.0
% Sand	11.2	12.3	8.2	7.3	8.9	6.4	3.9	16.7	9.0	6.1	7.8	4.1	6.0	19.8
% Silt	56.3	27.5	45.0	44.3	48.5	43.3	61.4	57.5	54.1	49.5	34.5	31.3	38.4	43.6
% Clay	32.5	60.2	46.8	48.4	42.6	50.3	34.7	24.4	36.5	44.4	56.8	64.6	55.3	36.6

a The presence of "U" qualifier indicates that the compound was analyzed for but not detected. The detection limit was assigned as the concentration for "U" qualified data.
b Data for sample location R1B were not included in the calculation of the arithmetic means for Area 1. The USEPA concurred with the exclusion of R1B as a reference location based on the analytical results.
c While the table presents detection limits for nondetect data, for the purposes of calculating the arithmetic mean, one-half of the detection limit was used for all non-detects (NDs); duplicate samples were considered individual samples in the calculation of the arithmetic mean. Arithmetic means are rounded to the number of sigificant digits to which the data were reported.
d Dashes (-) indicate that all values for a constituent were non-detects (NDs), and no arithmetic mean was calculated.

TABLE 4.2

CHEMICAL RESULTS FOR THE SAMPLES COLLECTED FOR THE BIOACCUMULAT10N ASSESSMENT

THAN SITE
MONTGOMERY, ALABAMA

Constituent	East Ditch Reference 6503 T-ED-R (Tadpoles)	6504 T-ED-R (Snails)	East Ditch-Location 1 6749 T-ED-1 (Snails)	6750 T-ED-1 (Mosquitofish)	6751 T-ED-1 (Dragonfly larvas)	6752 T-ED-1 (Tadpoles)	Area 1 Reference 6868 T-1-R (Salamanders)	6505 T-1-R (Worms)	6506 T-1-R (Crayfish)
Pesticides (ɪg/kg)									
alpha-BHC	0.50 U b	0.50 U	10 UD c	5.9D d	1.2 D	5.0 UD	2.5 U	0.50 U	0.50 U
beta-BHC	1.0 U	1.0 U	30 D	240 D	17 D	80 D	5.0 U	1.0 U	1.0 U
gamma-BHC	1.5 U	1.5 U	30 UD	15 UD	3.0 UD	15 UD	7.5 U	1.5 U	1.5 U
delta-BHC	1.5 U	1.5 U	30 UD	15 UD	3.0 UD	15 UD	7.5 U	1.5 U	1.5 U
4,4'-DDD	2.0 U	2.0 U	810 D	6,900 D	120	870 D	10 U	2.0 U	2.0 U
4,4'-DDE	1.3	1.0 U	840 D	5,800 D	230 D	730 D	18	14	1.0 U
4,4'-DDT	2.0 U	2.0 U	73 D	93 D	4.0 UD	33 D	10 U	2.0 U	2.0 U
2,4'-DDD	2.0 U	2.0 U	390 D	700 D	43 D	280 D	10 U	2.0 U	2.0 U
2,4'-DDE	1.0 U	1.0 U	39 D	170 D	4.2 D	52 D	5.0 U	1.0 U	1.0 U
2,4'-DDT	2.0 U	2.0 U	40 UD	20 UD	4.0 UD	20 UD	10 U	2.0 U	2.0 U
alpha-Chlordane	0.60 U	0.60 U	13 D	6.0 UD	2.4 D	6.4 D	3.0 U	0.60 U	0.60 U
gamma-Chlordane	0.60 U	0.60 U	22 D	49 D	3.1 D	16 D	3.0 U	0.60 U	0.60 U
Wet Weight (g)	21	30	16.5	28.7	20.3	14.6	3.5	33	25

TABLE 4-2 (Continued)

CHEMICAL RESULTS FOR TISSUE SAMPLES COLLECTED FOR THE BIOACCUMULATION ASSESSMENT

THAN SITE
MONTGOMERY, ALABAMA

	Area 1-Location 1					Area 1-Location 2		
Constituent	6507 T-1-1 (Worms)	6508 T-1-1 (Crayfish)	6509 T-1-1 (Mosquitofish)	6510 T-1-1 (Tadpoles)	6755 T-1-2 (Mosquitofish)	6756 T-1-2 (Tadpoles)	6757 T-1-2 (Worms)	6757 DUP T-1-2 (Worms; Duplicate)
Pesticides (ɪg/kg)								
alpha-BHC	25 UD	5.0 UD	25 UD	12.5 UD	2.5 UD	2.0 UD	5.0 UD	5.0 UD
beta-BHC	50 UD	19 D	50 UD	25 UD	7.7 D	7.5 D	10 UD	10 UD
gamma-BHC	75 UD	15 UD	75 UD	37.5 UD	7.5 UD	6.0 UD	15 UD	15 UD
delta-BHC	75 UD	15 UD	75 UD	37.5 UD	7.5 UD	6.0 UD	15 UD	15 UD
4,4'-DDD	1,600 D	78 D	3,900 D	670 D	130 D	89 D	180 D	170 D
4,4'-DDE	2,200 D	830 D	2,600 D	770 D	330 D	110 D	370 D	380 D
4,4'-DDT	100 UD	20 UD	100 UD	50 UD	10 UD	8.0 UD	20 UD	20 UD
2,4'-DDD	1,100 D	31 D	610 D	320 D	42 D	47 D	150 D	130 D
2,4'-DDE	170 D	7.9 D	89 D	55 D	5.0 UD	7.0 D	25 D	20 D
2,4'-DDT	100 UD	20 UD	100 UD	50 UD	10 UD	8.0 UD	20 UD	20 UD
alpha-Chlordane	83 D	9.3 D	33 D	30 D	3.1 D	2.4 UD	9.2 D	8.1 D
gamma-Chlordane	60 D	6.0 UD	36 D	23 D	3.0 UD	3.0 D	7.6 D	6.0 UD
Wet Weight (g)	19.2	4	33.7	24.0	25.7	20.1	24.7	24.7

TABLE 4-2 (Continued)

CHEMICAL RESULTS FOR TISSUE SAMPLES COLLECTED FOR THE BIOACCUMULATION ASSESSMENT

THAN SITE
MONTGOMERY, ALABAMA

Constituent	Area 2-Location 1				Area 3-Location 1				Area 3-Location 2
	6754 T-2-1 (Grubs)	6753 T-2-1 (Worms)	6743 T-3-1 (Worms)	6744 T-3-1 (Crayfish)	6745 T-3-1 (Snails)	6746 T-3-1 (Tadpoles)	6747 T-3-1 (Sunfish)	6747 DUP T-3-1 (Sunfish; Duplicate)	6748 T-3-2 (Worms)
Pesticides (ɪg/kg)									
alpha-BHC	5.0 UD	0.50 U	0.50 U	0.50 U	2.0 U	1.5 U	0.50 U	0.50 U	0.50 U
beta-BHC	10 UD	1.0 U	1.0 U	1.0 U	4.0 U	3.0 U	1.0 U	1.0 U	1.0 U
gamma-BHC	15 UD	1.5 U	1.5 U	1.5 U	6.0 U	4.5 U	1.5 U	1.5 U	1.5 U
delta-BHC	15 UD	1.5 U	1.5 U	1.5 U	6.0 U	4.5 U	1.5 U	1.5 U	1.5 U
4,4'.DDD	68 D	12	2.0	2.0 U	8.0 U	6.0 U	2.0 U	2.0 U	2.0 U
4,4'-DDE	270 D	110	7.3	2.7	3.6	4.3	23	14	16
4,4'-DDT	20 UD	2.0 U	2.0 U	2.0 U	8.0 U	6.0 U	2.0 U	2.0 U	2.0 U
2,4'-DDD	50 D	8.7	2.0 U	2.0 U	8.0 U	6.0 U	2.0 U	2.0 U	2.0 U
2,4'-DDE	24 D	3.8	1.0 U	1.0 U	4.0 U	3.0 U	1.0 U	1.0 U	1.0 U
2,4'-DDT	20 UD	2.0 U	2.0 U	2.0 U	8.0 U	6.0 U	2.0 U	2.0 U	2.0 U
alpha-Chlordane	11 D	2.6	0.60 U	0.60 U	2.4 U	1.8 U	0.61	0.60 U	0.60 U
gamma-Chlordane	6.0 UD	0.60 U	0.60 U	0.60 U	2.4 U	1.8 U	0.60 U	0.60 U	0.60 U
Wet Weight (g)	25.5	17.0	22.0	22.8	6.2	7.2	26.2	26.2	25.7

a The number associated with each sample is the analytical laboratory identification number (see Appendix G).
b The presence of a "U" qualifier indicates that the compound was analyzed for but not detected. The detection limit was assigned as the concentration for "U" qualified data.
c The presence of a "UD" qualifier indicates that the value was obtained by multiplying the detection limit by the dilution factor.
d The presence of a "D" indicates that a sample was reanalyzed using a dilution because one of the compound exceeded the highest concentration range for the standard curve.

TABLE 4-6
DETERMINISTIC FOOD WEB MODEL RESULTS SUMMARY 1
THAN SITE
MONTGOMERY, ALABAMA

Area of Interest	Raccoon	Mockingbird	Green Heron
	Total Hazard Index (% highest chemical) 2	Total Hazard Index (% highest chemical) 2	Total Hazard Index (% highest chemical) 2
East Ditch Reference	1.83E-06 (35% delta-BHC)	8.99E-03 (65% 4,4'-DDD)	0.0128 (47% 4,4'-DDD)
East Ditch	3.14E-03 (43% 4,4'-DDD)	15.4 (46% 4,4'-DDE)	40.0 (48% 4,4'-DDD)
Area 1 Reference	4.74E-06 (96% 4,4'-DDE)	0.0682 (97% 4,4'-DDE)	0.0486 (96% 4,4'-DDE)
Area 1	1.04E-03 (60% 4,4'-DDE)	12.3 (62% 4,4'-DDE)	8.46 (57% 4,4'-DDE)
Area 2	1.75E-04 (35% delta-BHC)	5.77 (67% 4,4'-DDE)	2.66 (67% 4,4'-DDE)
Area 3	1.18E-05 (79% 4,4'-DDE)	0.0854 (86% 4,4'-DDE)	0.0792 (89% 4,4'-DDE)

1 Detailed calculations are provided in Appendix H.

2 Constituents of interest in parentheses are those which contributed most to the respective total hazard index. The percentages presented reflect the percentage of the toatal hazard index for which the highest constituent contributed.

TABLE 5-1

PRELIMINARY ECOLOGICAL SEDIMENT VALUES
BASED ON THE FOOD WEB MODEL a

THAN SITE
MONTGOMERY, ALABAMA

		Green Heron				Mockingbird			
Location	Constituent	Model CS b (mg/kg)	Chemical Specific HQ c (unitless)	PESV b (HQ = 1.0) (mg/kg)	PESV b (HQ = 10.0) (mg/kg)	Model Cs b (mg/kg)	Chemical Specific HQ c (unitless)	PESV b (HQ = 1.0) (mg/kg)	PESV b (HQ = 10.0) (mg/kg)
East Ditch									
	4,4'-DDD	0.43	19.0	0.023	0.23	0.43	4.72	0.091	0.91
	4,4'-DDE	2.2	17.3	0.13	1.3	2.2	7.01	0.31	3.1
	2,4'-DDD	1.1	2.85	0.39	3.9	1.1	3.03	0.36	3.6
Area 1									
	4,4'-DDD	0.50	2.62	0.19	1.9	0.50	2.54	0.20	2.0
	4,4'-DDE	0.72	4.83	0.15	1.5	0.72	7.68	0.094	0.94
	2,4'-DDD	--d	--	--	--	0.34	1.75	0.19	1.9
Area 2	4,4'-DDE	0.38	1.79	0.21	2.1	0.38	3.88	0.098	0.98

a These values are not intended as final site cleanup levels.
b CS stands for concentration in sediment; preliminary ecological sediment value (PESV).
c HQ stands for hazard quotient.
d Dashes (--) indicate that a PESV was not calculated because the food web model did not generate a hazard quotient that exceeded 1.0 for the referenced constituent.

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APPENDIX E
EXPLANATION OF DATA QUALIFIERS

The following explanation of the data qualifiers shown on Table 1 is provided for the reader's benefit, and are excerpted from Chapter 11 (pages 11-5 and 11-6) of the Remedial. Investigation (RI) dated June, 1993. Citations refer to the RI, not the ROD.

- U-qualified data: The presence of a "U" indicated that the constituent was analyzed for but not detected. Therefore, U-qualified data were not included in the total number of samples with reported concentrations above detection limits.

- UD-qualified data: The presence of "UD" indicated that the constituent was analyzed for but not detected and the samples was diluted for re-analysis because one or more of the constituent concentrations exceeded the highest concentration range for the standard curve. UD-qualified data were not included in the total number of samples with reported concentrations above detection limits.

- J-qualified data: The presence of a "J" indicated that the mass spectral data passed the identification criteria showing that the constituent was present, but the calculated result was less than the practical quantitation limit (PQL), the lowest level that can be reliably achieved within specified limits of precision and accuracy, during routine laboratory operating conditions. Although the analytical result is considered to be estimated, J-qualified data were included in the total number of samples with reported concentrations above detection limits.

- B-qualified data: The presence of a "B" indicated that the constituent was also detected in the method blank. Unless the data point was further qualified with an "X" per the procedures described in Section 5.1, B-qualified data were included in the total number of samples with reported concentrations above detection limits.

- D-qualified data: The presence of a "D" indicated that the sample was diluted and re-analyzed because one or more of the constituent concentrations exceeded the highest concentration range for the standard curve. D-qualified data were included in the total number of samples with reported concentrations above detection limits.

- E-qualified data: The concentration for any constituent that exceeded the highest concentration level on the standard curve for that constituent was flagged with an "E". E-qualified data were included in the total number of samples with reported concentrations above detection limits.

- X-qualified data: As discussed in Section 5.1, data were qualified with an "X" as a result of a comparison of sample analytical results with analytical results for field blanks, equipment blanks; and laboratory blanks. X-qualified data are considered as nondetect data, and therefore, were not included in the total number of samples with reported concentrations above detection limits.